FOR THE PEOPLE
FOR EDVCATION
FOR SCIENCE

LIBRARY
OF
THE AMERICAN MUSEUM
OF
NATURAL HISTORY

PHILOSOPHICAL TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Present Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Considerable Parts of the WORLD.

LONDON:

Printed for C. DAVIS, PRINTER to the ROYAL SOCIETY; over-against *Gray's-Inn-Gate* in *Holbourn*.

M. DCC. L.

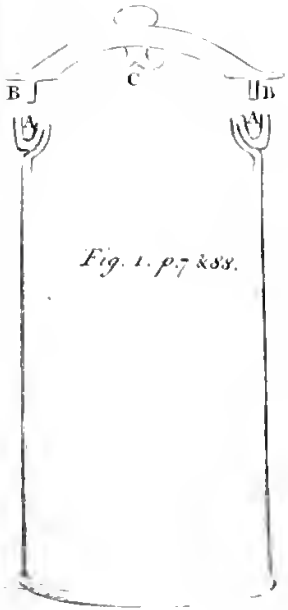
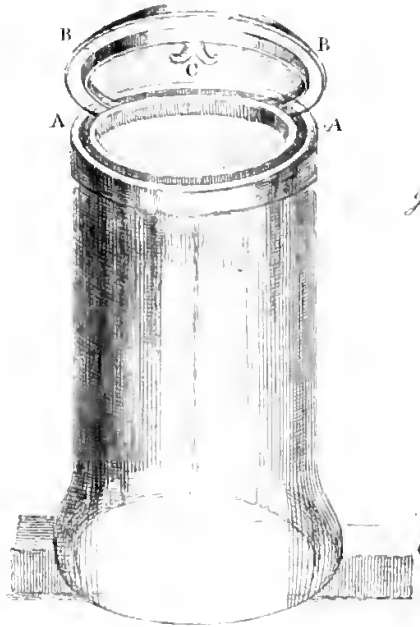


Fig. 1. p. 7 & 88.

Fig 2 p 7



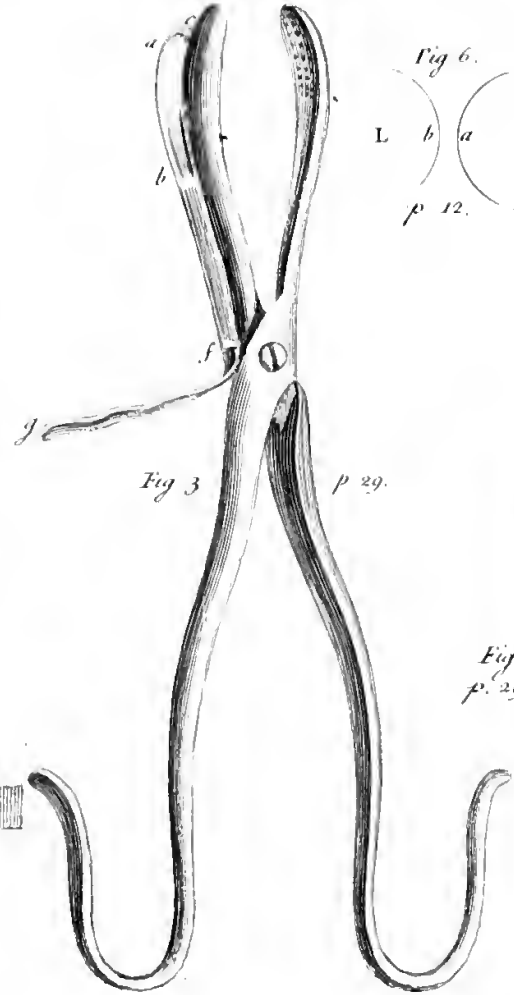
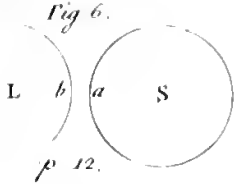


Fig 3 p 29.

Fig 6.



p. 12.

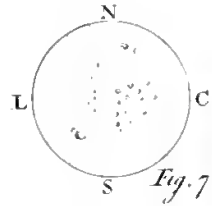


Fig. 7. p. 12.

Fig 4 p. 29.

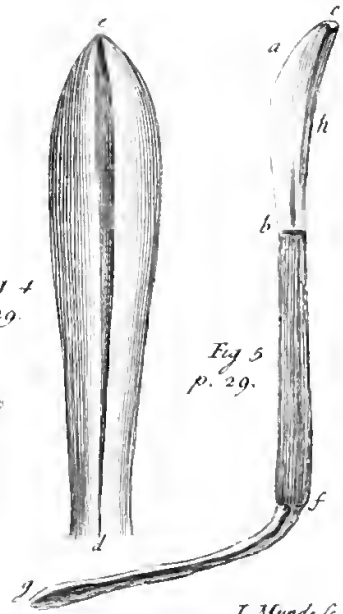


Fig 5 p. 29.

J. Mynde sc.

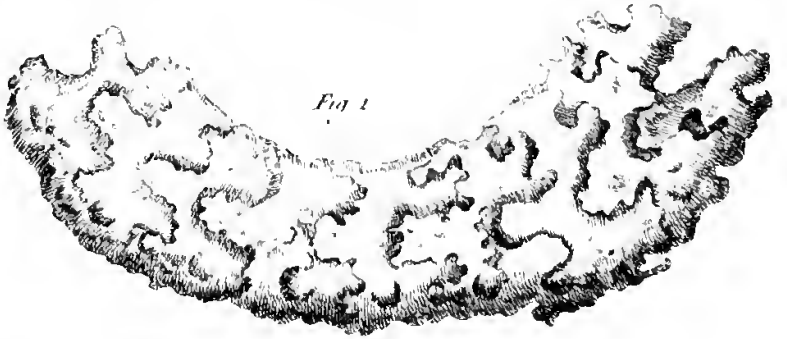


Fig. 1.

Fig. 3.

Fig. 2.

Fig. 4.

J. Mynde sc.

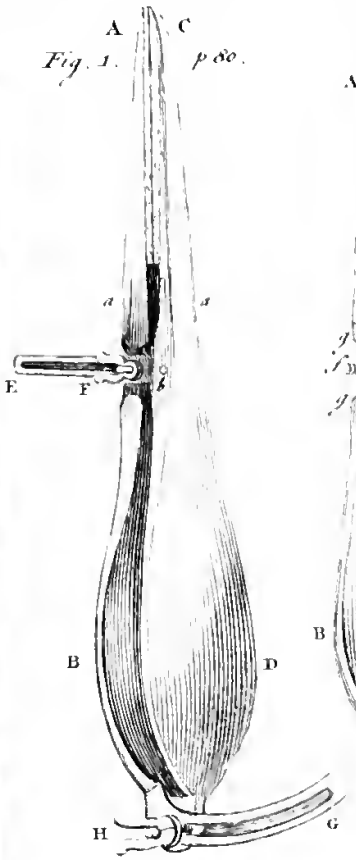


Fig. 1. p. 80.

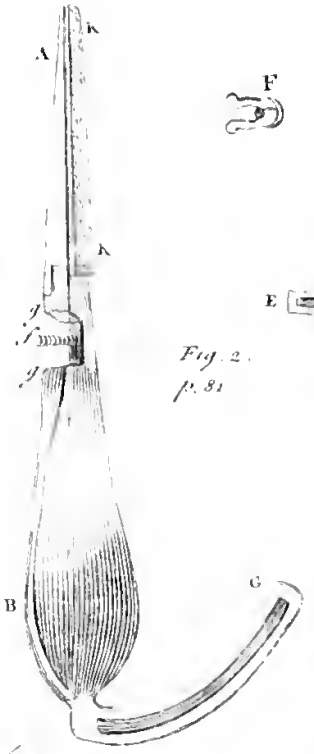
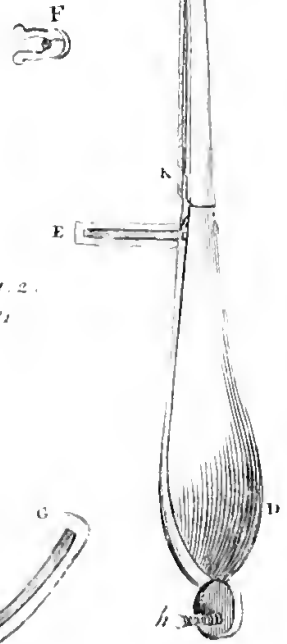


Fig. 2. p. 81



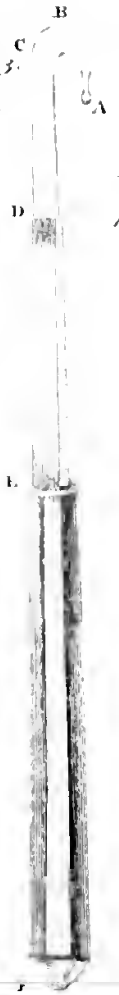


Fig. 3. p. 85.

Fig. 4 p. 85

Fig. 5 p. 85.

Fig. 7. p. 85.

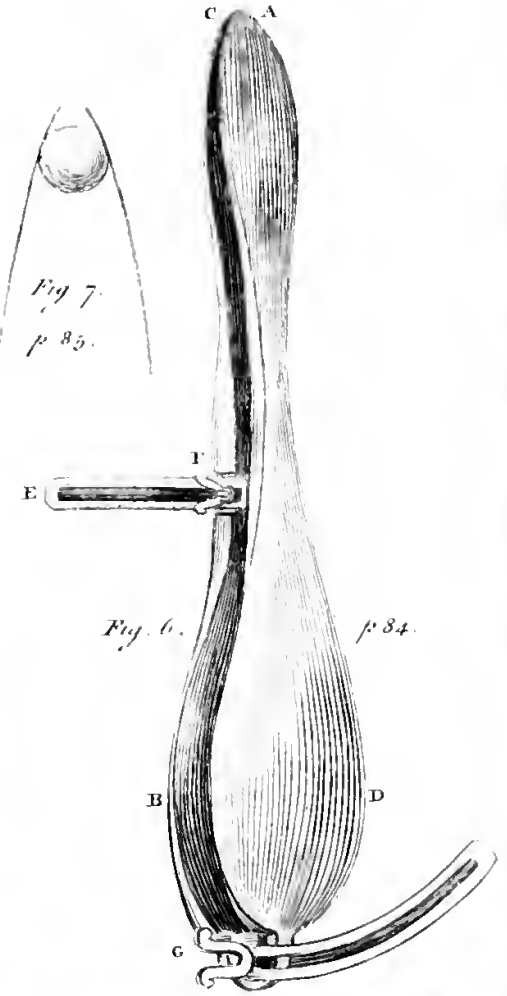


Fig. 6. p. 84.

J. Mynde sc.

Numb. 491.
Beginning VOL. XLVI.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *Jan. Febr.* and *March.* 1749.

I. *A Letter from the Rev.* Henry Miles *D. D. & F. R. S. to* Martin Folkes *Esq; Pr. R. S. concerning* Thermometers, *and some Observations of the* Weather. *p.* 1.

II. *An Account of the Case of a* Clergyman's Lady, *at* Cottered *near* Baldock *in* Hertfordshire, *who had a* Stone *under her* Tongue, *by* Wm. Freeman *Esq; F. R. S. p.* 5.

III. *An Account of* Glasses *of a new Contrivance, for preserving Pieces of* Anatomy *or* Natural History *in spirituous Liquors, by* Claud. Nic. le Cat, *M. D. F. R. S. Royal Demonstrator in Anatomy and Surgery at* Roan. *p.* 6. & 88.

IV. Observationes aliquæ *astronomicæ* à Reverendo P. P. *Suarez è* S. J. in *Paraquaria* habitæ, et per D. *Suarez* M. D. cum *Soc. Regali* communicatæ. *p.* 8.

V.

V. Obſervatio *Eclipſis ſolaris* Julii 14, et *Lunæ* Julii 28, 1748. *Madirti* habitæ à Domino *Antonio* de *Ulloä* R. S. S. *p.* 10.

VI. *Remarks on the principal* Paintings *found in the ſubterraneous City of* Herculaneum, *and at preſent in the Poſſeſſion of the King of* Naples; *by* ——— Blondeau *Eſq*; *communicated by* Tho. Stack *M. D. & F. R. S.* *p* 14.

VII. *An Account of a new invented arithmetical Inſtrument called a* Shwan-pan, *or* Chineſe Accompt-Table; *by* Gamaliel Smethurſt. *p.* 22.

VIII. *Extract of a Letter from* Benj. Heath *Eſq*; *to* Peter Davall *Eſq*; *Secr. R. S. incloſing a Propoſal for intirely removing the* only real Defect *in the* lateral Operation *for the* Stone; *by Mr.* John Mudge *Surgeon at* Plymouth. *p.* 24.

IX. *An Account of the* Locuſts, *which did vaſt Damage in* Walachia, Moldavia, *and* Tranſilvania, *in the Years* 1747 *and* 1748; *and of ſome Swarms of them, which, in the Months of* July *and* Auguſt 1748. *came into* Hungary *and* Poland; *by a Gentleman who lives in* Tranſilvania. *p.* 30.

X.

X. *A Letter from Mr.* Henry Baker *F.R.S. to the* Preſident, *concerning ſome* Vertebræ *of* Ammonitæ, *or* Cornua Ammonis; *communicated to Mr.* Baker *by the Rev. Dr.* Miles *F.R.S.* *p.* 37.

XI. *The Caſe of Mr.* Smith, *Surgeon, at* Sudbury *in* Suffolk; *the Coats of whoſe* Stomach *were changed into an almoſt cartilaginous Subſtance; communicated by the Rev. Mr.* Murdock *to* Cromwell Mortimer *M. D. Secret. R. S.* *p.* 39.

XII. *A* Catalogue *of the* FIFTY PLANTS *from* Chelſea-Garden, *preſented to the* Royal Society *by the Company of* Apothecaries, *for the Year* 1746. *purſuant to the Direction of Sir* Hans Sloane *Bart. Med. Reg. & nuper Soc. Reg. Præſ.; by* Joſ. Miller *Apothecary, Hort.* Chelſ. *Præſ. ac Prælect. Botan.* *p.* 43.

XIII. *The Reverend Mr.* Robert Clarke *to Mr.* Fleming, *concerning a Boy, who had a* Calculus *formed between the* Glans *and the* Præputium. *p.* 45.

XIV. *The Eſtabliſhment of a new* Genus *of* Plants, *called* Salvadora, *with its Deſcription; by* Laurence Garcin *M. D. F.R.S.*

of

of Neufchatel *in* Switzerland; *communicated in a Letter to Dr.* Mortimer *Secr. R. S.* *p.* 47.

XV. *A State of the* Engliſh *Weights and Meaſures of* Capacity, *as they appear from the Laws as well ancient as modern; with ſome Conſiderations thereon; being an Attempt to prove that the preſent* Avoirdepois *Weight is the* legal *and* ancient Standard *for the Weights and Meaſures of this Kingdom; by* Samuel Reynardſon *Eſq; F. R. S.* *p.* 54.

XVI. *A Letter from Dr.* le Cat *F. R. S. to* C. Mortimer *M. D. Secret. R. S. concerning the Cure of* Dry Gangrenes; *together with a Deſcription of a new-invented Inſtrument for the* Extirpation *of* Tumours *out of the Reach of the Surgeon's Fingers.* *p.* 72.

I. *A Letter from the Rev.* Henry Miles *D. D. & F. R. S. to* Martin Folkes *Esq; Pr. R. S. concerning* Thermometers, *and some Observations of the* Weather.

SIR,

Read Jan. 12. 1748. THE Candor with which you receive whatever is presented to you, tending to advance Natural Knowledge, invites me to offer this Paper to your Hands, on the Subject of the Thermometer.

It has been often complained of, that the Theories we have of the Air and Weather, are so imperfect, and that an unfinished one, of the honourable Mr. *Boyle*, published since his Death, should be the best we yet have; perhaps there is equal Reason for Complaint, that the Thermometer first introduced into Use in *England* by the same excellent Philosopher, should be so little improved for more than half a Century of Years, and be made to serve a not much better Purpose than that of Amusement.

For some Years past, several eminent Philosophers at home and abroad have applied themselves to bring this Instrument to greater Perfection, and to render it more useful; and among them the great Sir *Isaac Newton* did not think it unworthy his Attention.

It seems now to be pretty generally agreed, that Thermometers made with Quicksilver are preferable

to all others; that *extravagant Fluid*, as Mr. *Boyle* calls it, being moſt eaſily ſuſceptible both of Heat and Cold, and, when well purified, not liable to be obſtructed in its Motion.

I had, by ſome Years Experience, found both the Excellence of them, and the Neceſſity of keeping them in the open ſhaded Air, before I met with the learned and curious Eſſays Medical and Philoſophical of Dr. *George Martine*, in which he ſo much recommends their Uſe; and it was no ſmall Satisfaction to me, to find that Gentleman had proved, by Experiments, that Quickſilver both heats and cools faſter than any Liquor we know; faſter, I am ſure (ſays he), than Water, Oil, or even Spirit of Wine, and never freezes, by any Degree of Cold hitherto obſerved.

Might I be indulged the Liberty, I would embrace this Opportunity of inviting ſuch Gentlemen, as attend to this Branch of Natural Philoſophy, to conſider what Dr. *Martine* has ſaid to recommend the Uſe of Thermometers made with Quickſilver, and to place them in the open Air, guarded from the Sun's Rays; which, ſome Obſervations I made, and did myſelf the Honour to lay before the *Royal Society* formerly *, may ſerve to ſhew the Neceſſity of; eſpecially a more remarkable one, lately made, which I ſhall ſubjoin hereto.

There is another Particular of great Importance, which I fear we may rather wiſh than hope to ſee made a general Practice, recommended by the ſame Gentleman; that is, the conſtructing all Thermometers with one Scale But if this may not be expected, certainly

* See *Phil. Tranſ.* N°. 484, p. 613.

certainly no Thermometer ſhould be made without adjuſting two determinate and ſufficiently diſtant Points of Heat and Cold; ſuch, for inſtance, as thoſe of boiling Water, and of Water juſt beginning to freeze, and the intervening Space divided into a convenient Number of equal Degrees. By this means we ſhould be able to know what is meant by any ſpecified Degrees of Heat or Cold, and a Compariſon might be eaſily made of the State of the Air in diſtant Places, provided the Inſtruments were accurately made.

Dr. *Martine* ſeems to think, that the Degree of Cold which cauſeth Water to begin to freeze, is nearly equal in all Places, whatever little Variation there may be found in that Degree of Heat which cauſeth Water to boil, at different times, from the different Weight of the Atmoſphere: So that we may look upon theſe two Points as ſufficiently determinate.

An Account of an Obſervation I made of the ſudden Change of the Temperature of the Air on Tueſday *the 22d of* November *laſt; with the State of the Barometer, and other Circumſtances.*

On *Monday* the 21ſt in the Evening the Sky very clear, the Wind N. and a ſmart Froſt, the Barometer was 30 Inches $\frac{2}{10}$ $\frac{0}{100}$. At near 9^h the Thermometer without my Window at 7 *qr.* below 0, or freezing Point. The Thermometer within, of the ſame Conſtruction with it, and not a Yard from it,

the Room having had no Fire in it this Seaſon) at 5*gr.* nearly above 0.

On *Tueſday* Morning, at 4^h 20′, when I got up, I found the Barometer at 30. $\frac{2}{10}$ $\frac{6}{100}$ Inch; the Thermometer without at 14*gr.* $\frac{1}{2}$ below 0; that within at 2*gr.* $\frac{1}{2}$ above 0. I was much ſurpriſed hereat, and before I had finiſhed my Entry I returned to renew my Obſervation, fearing I might have made a Miſtake, but found I had not: At 7^h 40′ the ſame Morning, upon opening my Study-Window, I obſerved the Sky to look red and lowering; this induced me to go up to examine my Glaſſes, ſuſpecting there might be a Change, and found the Barometer fallen to 30. $\frac{0}{10}$ $\frac{2}{100}$, the Thermometer without riſen to 5*gr.* below freezing Point, but that within fallen to 1*gr.* above; the Wind getting about to W. and S. W. and before 10 in the Morning we had ſome Rain, and this ſevere Froſt went off. At this laſt-mention'd Hour the Thermometer without had riſen to 5*gr.* above 0; that within continuing at 1*gr.* as before. At 8^h $\frac{1}{2}$ that Evening the Thermometer without was at no leſs than 12*gr.* above 0, that within at 3*gr.* above 0: So that from that time I made my Obſervation at 4^h 20′ in the Morning to 8^h $\frac{1}{2}$ at Night, there was a Change in the Temperature of the Air abroad of 26*gr.* $\frac{1}{2}$; while the Change within-doors did not amount to more than 1*gr.* warmer.

I will treſpaſs no further on your Goodneſs, than (after have made this one Remark, that it ſeems probable from hence, that we may have frequently had greater Extremes of Heat and Cold by far, than have

have fallen under Obſervation) to beg Leave to ſubſcribe myſelf, with the higheſt Eſteem,

SIR,

Tooting, Dec. 6: 1748. *Your and the* Royal Society's *moſt obedient, and moſt humble Servant*;

Henry Miles.

II. *An Account of the Caſe of a* Clergyman's Lady, *at* Cottered *near* Baldock *in* Hertfordſhire, *who had a* Stone *under her* Tongue, *by* Wm. Freeman *Eſq; F. R. S.*

Read Jan. 19. 1748. THIS Subſtance, ſeemingly a Concretion of Stone or Chalk *, was voided in *July* 1748. from under the Root of her Tongue, juſt on the left Side of the middle String among the Blood-veſſels. It was lodged in a Cell formed by itſelf, the Traces being left behind exactly tallying. It was voided without Pain, or Effuſion of Blood.

The Patient began to feel in the Part affected ſome Uneaſineſs about 18 Months before the Diſcharge. The Pain extended itſelf ſometimes along the Jaw almoſt to the Ear; the Glands being at times ſwell'd, and a ſalt Rheum flowing into the Mouth. The Swelling of the Part gradually increaſed to about the Size

---

* The Stone is in the *Muſeum* of the *Royal Society*.

Size of a large Nutmeg; and, being felt by the Finger, was hard.

About a Fortnight before the Diſcharge, ſome white Specks appeared; upon which it was ſuppoſed that Matter was gathering; and being ſtill hard, a common Poultice of white Bread and Milk was applied, and then it preſently diſlodged itſelf, without any Application, and left the Patient ever ſince free from Complaint.

I was obliged to the Rev. Mr. *Chauncy*, the Husband of the Patient, for this Account.

III. *An Account of* Glaſſes *of a new Contrivance, for preſerving Pieces of* Anatomy *or* Natural Hiſtory *in ſpirituous Liquors, by* Claud. Nic. le Cat. *M. D. F. R. S. Royal Demonſtrator in Anatomy and Surgery at* Roan.

Tranſlated from the French *by* T. S. *M. D. F. R. S.*

Read Jan. 19. 1748.

THOSE who have Collections of Anatomy, or Natural Hiſtory, and preſerve Animals, Vegetables, or any of their Parts, in ſpirituous Liquors, are ſenſible how expenſive it is to ſupply the Waſte of theſe Spirits, which evaporate conſiderably.

Having in 1739. begun to make a Collection of this ſort, it was not long before I felt the Neceſſity I was under of contriving ſome kind of Veſſel, or ſome way of cloſing the common Glaſſes, which might prevent, or at leaſt diminiſh the Quantity of, this Evaporation. After

After trying ſeveral Methods, which did not fully ſatisfy me, I fixed upon the Glaſs, which is repreſented in the annexed Figures, TAB. I. *Fig.* 1. and 2.

Its Difference from the common ones conſiſts in having, quite round the Edge of its Orifice, a circular Groove or Chanel, *Fig.* 2. *AA*, an Inch deep for the ſmaller Sizes, and two Inches for the larger. This circular Groove is intended to receive a Border, *BB*, of the ſame Figure on the Cover *C*: In the middle of the Concavity of this Cover is a double Hook, on which the Threads are to be faſtened, which ſuſpend the Piece or Preparation that is to be put into the Glaſs.

In putting the Piece into the Glaſs, which contains the preſerving Liquor, Care muſt be taken to place it on the Hooks in the ſame Poſition, which you intend it ſhould keep in the Glaſs: That done, you are to pour Oil, or Quickſilver, which is better, into the circular Groove *AA*, ſo as to make it about half-full. Then you are to let down the Piece into the preſerving Liquor; and when it is intirely ſunk down, the Cover *C* ought to light upon the Glaſs, and its circular Border *BB*, enter into the circular Groove *AA*, where it falls into the Oil or Quickſilver, which riſes up and fills the whole Groove; by which means the Glaſs is in ſome meaſure hermetically ſealed. The Oil indeed permits ſome ſmall Evaporation; the Quickſilver more completely anſwers the End of this Invention, but it is more expenſive.

As I had contrived this Glaſs for my own private Uſe, I neglected making it public; till, happening to be preſent at the public Meeting of the *Academy* of

of *Sciences* of *Paris*, at *Eaſter* 1746, I heard Mr. *de Reaumur* read a Memoir on this Subject. My Glaſs ſeem'd to me vaſtly preferable to the Veſſels propoſed by that great Academician. This Incident rouzed my Emulation, and gave me the better Opinion of my Glaſs, a Pattern of which I ſent to M. *Morand*. The ſame Motive engages me to take the Advantage of the Freedom of Correſpondence re-eſtabliſhed between *France* and *England*, in ſending this Deſcription to the *Royal Society*.

IV. Obſervationes aliquæ *aſtronomicæ* à Reverendo P. P. *Suarez è* S. J. in *Paraquaria* habitæ, et per D. *Suarez* M. D. cum *Soc. Regali* communicatæ.

Preſented Jan. 19. 1748-9.

ANNO 1747, *Februarii* 24, poſt meridiem, nubilo cœlo toto fere tempore eclipſis Lunæ, hæc tantum obſervari potuerunt in miſſionibus *Paraquariæ Soc. Jeſ.* à *P. Bonaventura Suarez*, ejuſdem Soc. miſſionario, in oppido *Sancti Angeli Cuſtodis*, poſt emerſionem ſecundi digiti Lunæ ex umbra Terræ, teleſcopio ped. 10½.

	h	′	″
Ariſtarchus emergit	14	31	47
Tycho emergit	14	37	30
Calippus emergit	14	56	47
Dionyſius emergit	15	0	4
Mare Criſ. incipit emergere	15	13	17
Finis Eclipſis	15	16	4

Intercapedinem

Intercapedinem marginum occidentalium Lunæ, et *Maris Criſii* vix capiebat diameter minor maculæ *Platonis*.

Oppidum *Sancti Angeli* in miſſionibus *Paraquariæ* Soc. *Jeſu* eſt reliquis orientalius. Ejus longitudo ab inſula *Ferri* eſt *gr.* 323. *m.* 30. et latitudo *gr.* 28. *m.* 17 *Auſt.*

Eclipſis Lunæ ab eodem obſervata in oppido *Sanctæ Mariæ Majoris*, eodem anno 1747. *Auguſti* 19. horis p. m.

Penumbra ſenſibilis erat hor. 14. 44′.

Immerſio Lunæ et macularum in umbram.

	h	′	″
Initium	14	55	44
Ariſtarchus	15	0	13
Galilæus	15	0	41
Mare humor. incip.	15	4	14
Ang. infer. terræ pruinæ	15	5	29
Copernicus, *&c.*	15	9	26
Mare humor. totum	15	9	26
Plato, et Tycho æquidiſtabant a cent. umbræ	15	13	44
Idem	15	17	2
Plato et Tycho ſimul in margine umbræ	15	20	25
Digiti 6 obſcurati	15	24	6
Menelaus	15	27	28
Dionyſius	15	29	35
Lacus Somniorum	15	36	10
Maris Criſii Initium	15	43	41
Medium	15	46	26

	h	′	″
Finis . . .	15	49	16
Totalis obſcuratio Lunæ . .	15	53	16

Emerſio Lunæ ex umbra.

	h	′	″
Initium emerſionis . . .	17	34	48
Grimaldus	17	36	52
Ariſtarchus . . .	17	40	0
Plato	17	53	34
Tycho	18	0	23
Digiti 6 obſcurati . . .	18	3	30

Luna prope occaſum vaporibus horizontis tremula non amplius fuit obſervata.

Toto tempore eclipſis Lunæ fuit cœlum valde ſerenum.

Longitudo *S. Mariæ Maj.* ab inſula *Ferri* gr. 322, m. 40.

Latitudo gr. 27, m. 51. Auſtr.

V. Obſervatio *Eclipſis ſolaris* Julii 14, et *Lunæ* Julii 28, 1748. *Madriti* habitæ à Domino *Antonio* de *Ulloä* S. S. R.

Preſt. Jan. 26. 1748-9.

CUM ad faciendam hujus eclipſis obſervationem paratum quidem eſſet teleſcopium reflexionis duos circiter pedes oblongum; cumque ſatis notus haberetur motus penduli cujuſdam aſtronomici, quo in mea ad *Peruviana* regna migratione ad plurimas ibidem una cum D. *Georgio Joanne* peractas obſervationes uſus fueram, animadverti

animadverti initium eclipſis in tempore vero accidiſſe ſub horam . . 8 49 6

Macula *ab* (TAB. I. *Fig.7.*) in diſco ſolis notata inter ipſius orientalem auſtralemque partes, quæque optime tunc potuit diſcerni, quod nulla alia eſſet ei proxima, cœpit ſub Lunam immergi hora . . 10 13 44½

Totalis hujus maculæ immerſio . 14 46′

Minime licuit nec emerſionem hujus maculæ, nec totius eclipſis, finem obſervare, qui cum ſol in ſua majori reperiretur ſupra horizontem altitudine, deerat teleſcopio commoditas neceſſaria ad illud perficiendum. Similiter nec potuit prolixus digitorum numerus, ut oportet, haberi; cum diſpoſitio ipſorum inquirendorum cauſa facta minime deſiderio aut exactitudini debitæ ſatisfecerit. Antequam contactus viſualis fieret limborum duorum planetarum 45′, aut ferme limbus Lunæ ſeſe diſtinctum ope teleſcopii obtulit percipiendum; idque abs dubio, quod interceptare radios lucis ex illa parte incepiſſet; ideoque quo magis cæteræ ipſius diſci lunaris partes a ſolis diſtabant, eo plus confuſæ cernebantur.

Sub eclipſis initium viſa eſt pars diſci lunaris interpoſiti quaſi coloris cujuſdam in rubrum declinantis, qui poſtmodum excrevit prout eclipſis majus habuit incrementum.

Dies equidem extitit ſerenus, et atmoſphera nubibus omnino libera, ſicque in veſperum ſine mutatione permanſit. Cum eclipſis medium ſubeſſet, aliqua diminutio lucis apparuit; notatumque eſt ipſius reflexionem aliquantulum debiliorem fuiſſe redditam; aërem-

que aliquid caloris tempori reſpondentis ſenſibiliter amiſiſſe; quæ mutatio poſt ſemihoram ab incepta eclipſi initium aſſumens uſque ad illius exitum permanſit; poſtquam iterum calor ut antea rediit.

Vide TAB. I.

Fig. 6. S, Sol, *L*, Luna, *a*, limbus ſolis, a quo incepit immerſio; *b*, limbus lunæ, qui ſeſe ante eclipſin obtulit percipiendum.

Fig. 7. NOSL, diſcus ſolaris; *L*, oriens; *O*, occidens; *N*, pars borealis ejuſdem diſci; *S*, pars auſtralis; *ab*, macula in ſolare diſco obſervata; *c*, alia in eodem diſco inter ſeptentrionem, et ortum, ad quam minime pertigit eclipſis; *d*, aliæ quam plurimæ maculæ in medio diſci ſolaris.

Obſervatio Eclipſis partialis Lunæ ſub diem 8 Aug. 28 Julii 1748. Matriti, *a D.* Antonio de Ulloa *navis bellici a Rege Cath. præfecto una cum excellentiſſimo Duce* Aſidonienſi, *naturalium diſciplinarum et omnigenæ eruditionis viro.*

Eodem quidem teleſcopio, quo obſervata fuit præcedens ſolis eclipſis, uſus ſum ad id peragendum in defectu Lunæ, qui accidit die 8 *Auguſti* anni 1748. ipſiuſque phaſes annotandas quæ ad tempus verum reductæ ita ſe habent.

	h	′	″
Penumbra quidem percipi incepit ſub horam noctis . . .	09	45	42
Initium eclipſis mihi viſum eſt, etſi non ſine aliquo dubio, accidiſſe . .		50	0

Imm.

	h	'	"
Imm. Capuani . . .	10	0	13
Principium immerſionis Maris Humorum		4	10
Tycho umbram ingredi incipit .		11	54
Totalis immerſio Tychonis . .		14	14
Initium immerſionis Grimoaldi .		15	15
Omnimoda immerſio Maris Humorum		15	18
Omnimoda immerſio Grimoaldi .		20	51
Reinoldus umbram ſubiit . .		28	40
Snelius et Furnerius eandem attingunt		44	40
Snelius et Furnerius ſub umbra .		47	40
Fracaſtorius immergi incipit . .		49	0
Grimoaldi emergentis initium . .		51	16
Mare Nectaris immergi incipit .		52	20
Grimoaldus totus emerſit . .		56	32
Initium immerſionis Maris Fœcunditatis	11	13	58
Mare humorum incipit ab umbra liberari		19	11
Mare humorum totum extra umbram		30	18
Totalis emerſio Maris Nubium . .		40	24
Totalis emerſio Maris Nectaris . .		45	16
Tycho incipit ab umbra emergi .		47	35
Totalis emerſio Tychonis . .		49	54
Umbræ finis in diſco lunari .	12	10	22
Penumbræ fortioris finis . .		17	25
Penumbræ qualiſqualis finis . .		22	12

Eclipſis initium dubium extitit, quod umbra et penumbra non bene diſcernerentur; ideoque de eo difficulter judicari potuit, etiam ſi ad obſervationem peragendam ſatis commoda, et ab impedimentis libera permanſiſſet atmoſphæra.

Antonius de Ullöa.

VI.

VI. *Remarks on the principal* Paintings *found in the ſubterraneous City of* Herculaneum, *and at preſent in the Poſſeſſion of the King of* Naples; *by* ——— Blondeau *Eſq*; *communicated by* Tho. Stack *M. D. & F. R. S.*

Read Jan. 26. 1748-9.

THE Paintings found under-ground in *Herculaneum* near *Portici*, are all done on *Stucco* in Water-colours in *Freſco*. They have been taken from the Walls of an Amphitheatre, a Temple, and Houſes, and are in great Variety, ſome exceeding fine, and well preſerved. I divide them into two Claſſes; the firſt of which contains the four following Pictures.

The firſt is a large Piece of 7 Feet by 5, repreſenting *Theſeus*, after having killed the *Minotaur*. He is naked at full Length, holding a Club or knotted Stick in his left Hand by the ſmall End: A young Woman by his Side, holding the ſaid Club a little higher with her right Hand, and looking up wiſhfully at him: Three Children of different Ages; one kiſſing his right Arm, which is extended; the ſecond his left Leg, which is a little rais'd; and the third graſping and kiſſing his left Arm; all as it were wiſhing him Joy, and careſſing him after the Victory; the *Minotaur* lying on his Back dead at his Feet, a human Body with a Bull's Head and ſhort Horns. This Piece has been a great deal larger. On the upper Part is Part of a naked Arm with a Trumpet.

The ſecond is a noble Piece of 10 Feet by 7, intire, and ſeems to repreſent *Rome* triumphant;

viz. A grand Figure of a Woman ſitting, with a Garland of Flowers on her Head, a majeſtic commanding Countenance, a knotted Club, exactly like that of *Theſeus*, long and tapering, in her left Hand, reſting herſelf on her right Elbow, with her Hand to her Temple: A young Fawn laughing over her Shoulder, with a muſical Inſtrument of twelve Pipes in his Hand. At her Side is a Basket of Fruit: Over-againſt her a naked Figure of a Man, robuſt and vigorous, with a Beard; his Back ſhort, and, to Sight, his Face turned to the left Shoulder; a Garland of Flowers or Laurels on his Head; a Quiver, a Bow and Arrows by his Side; under his left Arm ſomething like Part of a Lion's Skin, and one Paw, but faintly expreſſed: A fine natural Attitude; moſt exquiſite Proportion and Drawing. A little higher, cloſe by him, a Genius or Goddeſs of Fame, with Wings, a Garland on her Head, a Sprig like Ears of Corn in the left Hand, and pointing with the right; and both ſhe and the Man looking to a young Infant below (a moſt beautiful Figure, and natural Attitude) ſucking a Doe, finely drawn and ſpotted, which is licking the Child's Knee. Under their Feet an Eagle with his Claw upon a Globe, and a Lion, both as large as Life. Some reckon the Man *Hercules*, and the Woman *Pomona:* But *Hercules*, I think, did not uſe the Quiver; and *Pomona* has no ſuch Majeſty, nor any Buſineſs with a Club, which is longer and ſmaller than that of *Hercules*.

The third is a Piece of four Feet ſquare, repreſenting the Centaur *Chiron*, ſitting, as it were, on his Backſide, and teaching his Pupil *Achilles*, a young Lad of about twelve, to play upon the Harp. Part of the Horſe is a very difficult forced Attitude; the whole

whole Body being in View; left fore Foot extended; great Expreſſion and Attention both in *Achilles* and *Chiron*, who is putting his right Hand round the Boy, and playing, by the Help of a ſmall Inſtrument, on the Strings, which are ten in Number. This is accounted a moſt maſterly Piece as ever was ſeen. *Chiron* has a Mantle tied round his Neck, made of the Skin of ſome Animal; and *Achilles* ſtands upright naked.

The fourth is a Piece of 5 Feet by 4, repreſenting ſome very ſolemn and melancholy Story of the *Romans*, and contains ſeven Figures, three Men and four Women. Perhaps the Story of *Virginia*, when *Appius Claudius* wanted to accuſe her falſely, in order to gratify his Luſt. One Man ſitting in a penſive Mood, his left Elbow on his Knee, and his Hand up to his Forehead: Another ſitting over-againſt him, ſetting forth ſomething in a Paper, which he holds to the Breaſt of the firſt: A young Woman ſitting on the right Side of the firſt, a Figure expreſſing great Concern; her left Hand affectionately about his Shoulder: And another young Woman ſtanding with great Attention and Surprize by her: Behind both, the Figure of a Woman larger than the reſt, with a Quiver appearing above her Shoulder, as *Diana:* An elderly Woman in a ſuppliant bending Poſture, with her Finger at her Chin, as if ſhe were liſtening with great Grief, and her Face to the firſt Figure. Alſo an old Man, in much the ſame Attitude, in great Grief, as if weeping. Perhaps the Family of *Virginia* liſtening to the Accuſation againſt her, and fearful leſt ſhe ſhould be delivered over to the brutal Luſt of the Conſul: To avoid which, when no other Remedy was left, *Virginius* deſired to ſpeak with his Daughter in private, and killed her.

Theſe

Theſe are the four capital Pieces; and they are ſo extremely well executed, that Don *Franceſco de la Vega*, a Painter, whom the King of *Naples* ſent for from *Rome*, as one of the beſt Hands, to take Draughts of theſe Paintings, told me, that if *Raphael* were now alive, he would be glad to ſtudy the Drawings, and perhaps take Leſſons from them. Nothing can be more juſt and correct: The Muſcles are moſt exactly and ſoftly mark'd, every one in its own Place, without any of that preternatural Swelling, which is ſo much over-done in ſome of the beſt *Italian* Maſters, that all their Men are made to appear like *Hercules*. It is ſurpriſing how freſh all the Colours of theſe Pictures are, conſidering that they have been under-ground above 1650 Years; beſides the Years they ſtood, before they were covered by the Eruption, which cannot be exactly determined.

Theſeus in the firſt, and the naked Figures in the ſecond Piece, are a good deal upon the red Colour; but the Women and Children are of as ſoft and mellow fleſh Colours as if painted in Oil. The third and fourth are ſo highly finiſh'd, that you can ſcarcely diſcern whether they are done in Water or Oil-colours. The laſt pleaſed me moſt; the Compoſition is good; the Attitudes natural, and of fine Kinds; the different Characters juſtly expreſs'd; the Drawing and Drapery exquiſite; and, tho' done in Water, with only two or three Colours at moſt; yet the Light and Shade are ſo artfully managed, that the Figures are quite out of the Surface. The Connoiſſeurs prefer the third, or the Centaur.

We now come to thoſe of the ſecond Claſs, which are as follows.

1. A Piece of 4 Feet by 3, ſuppoſed to be the Judgment of *Paris*. Three Goddeſſes, with Rays like Circles of Glory about their Heads, which are very fine: The firſt ſitting inclined; two ſtanding naked; good Drawing, and natural Attitudes. A Figure of a Shepherd at a Diſtance above them, with a crooked Staff in his Hand, a Garland on his Head, his right Hand graſping ſomething, which is not diſtinctly ſeen, as not being ſo much finiſh'd as the reſt.

2. A Piece of four Feet ſquare, repreſenting *Hercules*, when a Child, tearing the Serpent in Pieces with great Vigour and Fierceneſs in his Eyes: An old Man drawing a Dagger, being ſtartled at the Danger, in order to kill the Snake: A Woman deſign'd holding up her Hands to Heaven: An old Woman holding a Child in her Arms. The Whole natural and well-drawn.

3. A Piece of 4 Feet by 3: An old Man naked, ſitting: A naked Boy ſtanding by his Side, with a Piece of a Rod or Twig in each Hand: The old Man is pointing with his Finger, and teaching the Boy ſomething. Fine Drawing, ſomewhat defaced.

4. A Piece of 6 Feet by 3: A Half-Length of *Jove* with Thunder in his Hand: A little *Cupid* looking over his Shoulder: A Rainbow: An Eagle: A bold old Head: A Figure like *Venus* coming from bathing, naked down to the Thighs. Beautiful Contour, great Softneſs, and fine fleſh Colours; ſeems to have the privy Parts of a Man, an Hermaphrodite.

5. A ſmall Piece, about fourteen Inches ſquare: Two fine Female Heads, or Half-Lengths; one with a Book in her Hand; great Expreſſion! Two Muſes.

6. A

6. A Piece of about eighteen Inches ſquare; two Figures of Women like Graces; one naked to the Middle, ſitting; ſomething like a Quiver at her Feet; another in a Robe, ſtanding, and leaning on her Elbow: Good Attitude; Drawing and Drapery very fine; Colours faint.

7. and 8. Two Pieces, of three Feet ſquare, of *Egyptian* Sacrifices. Firſt, The worſhipping of an Idol, which is placed above in the Portico of a Temple, and appears bloody: Seven Figures bending and ſuppliant in the Act of Adoration: An Altar in the middle: Two Birds, Storks, ſtanding one on each Side: Many other Figures faint. —— Second, a Prieſt ſacrificing upon a flaming Altar: A Row of different Figures on each Side: Two in the middle in the Act of Preaching. Attitudes very juſt and natural, finely done, great Solemnity or Horror: When look'd at near, ſeems more daubing and unfiniſhed: By *Virtuoſi* eſteemed a great Piece of Antiquity, and of great Study.

9. Is a Half-Length of a Man like a Prieſt, with a ſmall Water-pot, pouring it into a Baſin, ſeen by the Light of a Lamp.

10. Is *Orpheus* and *Venus* lying together, kiſſing and careſſing, chain'd by the Legs: A Servant holding a Harp. Finely deſigned, but defaced.

11. An old Man ſitting, with a Cup in one Hand, a Stick and Garland in the other.

12. Is a Half-Length of a young Woman.

13. Is a Piece of two and a half by two Feet: Old *Silenus* holding in his Arms *Bacchus* a Child: A Satyr: A *Baccante*: *Mercury* ſitting below: A

Tyger and Aſs lying. Finely drawn, and naturally expreſs'd.

14. A ſleeping Nymph; a Satyr lifting up her Robe: Three By-ſtanders, who ſeem to be very curious. A ſmall Piece.

15 and 16. Two ſmall Pieces of Satyrs raviſhing Nymphs: Well drawn, and natural Attitudes, but faint and defaced.

17. A Piece of four Feet and a half by one Foot and a half: A Figure of a *Roman* Lady, almoſt full Length, in Attitude of great Grief; her Head a little inclin'd; her Arms dropp'd down, and her Fingers claſped; a Sword, with the Handle leaning in the Hollow of her Hand. Very juſt and natural Expreſſion, well finiſhed.

18. The Goddeſs *Flora* as deſcending from Heaven. Fine Contours: About two Feet ſquare.

19. Is a Piece three Feet ſquare: A naked Figure with a Lance like a General: A Woman ſitting: A young Man holding his Horſe: An old Woman. Finely done, but defaced.

20. *Orpheus* with his Harp, ſitting on a Rock by the Sea Side: A Child or Sea-God riding on a Dolphin, preſenting him with a Book.

21. Ten ſmall Pieces of *Roman* Ceremonies with many Figures; ſome eating, dancing making Love; others tied like Priſoners.

22. Eight ſmall *Cupids* in different Attitudes, and different Paces. Very good.

23. A Pheaſant and other Birds: Two ſmall Baſkets, one tumbled down: A Rabbit eating. Exquiſitely done.

24. Two naked Figures, with *Cupid* betwixt.

25. A Figure in the Attitude of a Warrior, with a Sword in his right Hand, a Buckler in his left, and a Cup with ſome Jewels at his Feet.

26. A large Piece of Architecture, which, look'd at near, ſeems rough and daubing, at a Diſtance very good Perſpective. You ſee quite thro' two Portico's, one above another, into a Palace or Church. Very curious Architecture, Colours very lively and freſh.

27. A Landskape with Houſes, Ruins, a Theatre. Good Architecture: Figures of Pheaſants, Mules loaded, *&c.*

28. Another Piece of Architecture and Perſpective, very good.

A great many other Figures of Men and Women, not eaſy to be deſcribed, becauſe pretty much defaced: Alſo many Fancies of Birds, Beaſts, Chariots drawn by different Animals, Children driving: All in ſmall.

Little Pieces of Landskapes, and other Ornaments for the Walls of their Houſes, which were painted moſtly of a yellowiſh Colour; divided into Squares or Panels; with thoſe Pieces of Painting in the Panel, and a Border round it. There is a very good Piece of Ornament or Cornice, that was upon the Picture of *Theſeus*, of a very good Taſte, and finely finiſhed.

See Accounts of this ſubterraneous City in theſe *Tranſ.* N°. 456, *p.* 365. N°. 458, *p.* 484, 489, 493.

VII.

VII. *An Account of a new invented arithmetical Inſtrument called a* Shwan-pan, *or* Chineſe Accompt-Table; *by* Gamaliel Smethurſt.

Read Jan. 29. 1748. THE *Chineſe* have for many Ages picqu'd themſelves on being the moſt wiſe of any Nation in the World; but late Experience and cloſer Converſe with them hath found this Pride to be ill-grounded. One Particular, in which they think they excel all Mankind, is, their Manner of accompting, which they do with an Inſtrument compoſed of a Number of Wires with Beads upon them, which they move backwards and forwards. ThisInſtrument they call a *Shwan-pan.*

Now I truſt I have form'd one on the Plan of our 9 Digits, that in no caſe falls ſhort of the *Chineſe Shwan pan,* but in many excels theirs.

The *Chineſe,* according to the Accounts of Travellers, are ſo happy as to have their Parts of an Integer in their Coins, *&c.* decimated, ſo can multiply or divide their Integers and Parts as if they were only Integers. This gives them the Advantage over *Europeans* in reckoning their Money, *&c.* But then, as they have no particular Place ſet apart for the leſſer Denominations of Coins, Weights, Meaſures, *&c.* their Inſtrument can't be uſed in *Europe,* nor can it be ſo univerſally applied to Arithmetic as mine, for I have provided for the different Diviſions of an Integer into Parts.

This

This Inſtrument hath the Advantage of our Digits in a great many Caſes. Firſt, the Figures can be felt, ſo may be uſed by a blind Man. If it had no other, this alone would be ſufficient to gain it the Attention of Mankind.

Another Advantage from it is, that, when attain'd, this Method is much ſwifter than by our Digits, and leſs liable to Miſtakes: It is likewiſe not ſo burdenſome to the Memory in working the Rules of Arithmetic, as by our Digits, we being oblig'd to carry the Tens in the Mind from one Place to another, which are ſet down by the *Shwan-pan*. —— One may work a whole Night, without confuſing the Head, or affecting the Eyes in the leaſt.

It may be of great Uſe to teach People the Power of Numbers, likewiſe to examine Accompts by; for, as the Perſon will, by the *Shwan-pan*, work it a quite different Way, it will ſerve as if another Perſon had gone thro' the Accompt; if it proves right with the written one, they may reſt aſſured the Work is true.

It may be a very pretty Lure to lead young People to apply their Minds to Numbers.

The Inventor produced one of theſe Inſtruments before the *Society*, and work'd ſeveral Queſtions in Arithmetic upon it. It much reſembles the *Abacus* of the Ancients.

C. M.

VIII.

VIII. *Extract of a Letter from* Benj. Heath *Esq*; *to* Peter Davall *Esq*; *Secr. R. S. incloſing a Propoſal for intirely removing the* only real Defect *in the* lateral Operation *for the* Stone; *by Mr.* John Mudge *Surgeon at* Plymouth.

Dear Sir,

Read Feb. 2. 1748. * * * I TAKE the Freedom of conveying to you a Memoir written by a very ingenious young Surgeon of my Acquaintance propoſing an Improvement in the lateral Method of cutting for the Stone. His View in putting me on giving you this Trouble is, that it may be laid before the *Society*; and if it be thought to deſerve it, it may be communicated to the Public in their *Tranſactions*. I am,

SIR,

Exeter, Jan. 16. 1748.

Your moſt humble Servant,

Benj. Heath.

A Propoſal for intirely removing the only real Defect *in the* lateral Operation *for the* Stone.

THO' the lateral Method of cutting for the Stone is now almoſt univerſally allow'd to have greatly the Advantage of any other hitherto diſcover'd, yet it muſt be confeſs'd, that the Difficulty and

and Hazard attending the Extraction of large Stones this Way, has really robb'd it of its Title to Perfection; for tho' the Inciſion be made to the Wiſh, quite through the Proſtate, and carried on to the Neck of the Bladder, if this be the Caſe (for it frequently happens to the contrary) as the Bladder itſelf in general is not, nor in all Probability can be, wounded in this Way of operating, the real Aperture after all for the Exit of a large Stone is ſo ſmall, that the Parts muſt ſuffer moſt violent Lacerations, and a Train of conſequent Evils.

The old Method indeed is greatly more obnoxious to this Misfortune, becauſe the Parts are torn to Pieces by downright Violence, without any previous Inciſion of any Conſequence to prepare them for the Egreſs of the Stone; and this Imperfection in the Operation is ſo notoriouſly apparent, and ſo deſtructive in fact, that this Method is deſervedly in Diſeſteem, and almoſt univerſally diſcarded.

I wiſh it could be ſaid, that the lateral Method was intirely free from this Imperfection; but I fear an impartial Inquiry will make it clear, that three Fourths of the Accidents which have attended this Operation, may in truth be attributed to exceſſive Diſtenſions and Lacerations of the Bladder, thoſe few Caſes, which have miſcarried from (what may have been ſuppoſed) a mere ſymptomatic Fever, will, I believe on a ſtrict Diſquiſition, afford a ſhrewd Suſpicion, that this very Fever itſelf aroſe from ſome Violence offer'd to the Bladder, in the forcible Extraction of the Stone.

I will not enter into a ſtrict Examination of thoſe fatal Symptoms which ſometimes ſucceed the Operation in grown Subjects, in order to prove that they

in general proceed from the Bladder's being too roughly dealt with, becauſe I take the Caſe to be of itſelf very evident: Unleſs the Habit is remarkably bad, to what elſe ſhall we attribute violent Pain, and the ſucceſſive Inflammation, Tumour, Suppreſſion of Urine, Mortification, *&c.*? Theſe ſurely are not the Attendants on a ſimple Inciſion only; for conſtant Experience evinces, that the Bladder, tho' an Organ of great Importance, and eſſentially neceſſary to the animal Oeconomy, may be wounded with as little Danger of any of the above-mention'd Evils, as any other membranous Part.

But I believe we ſhall not be at a Loſs for the true Cauſe of all thoſe Miſchiefs, if the State of the Parts in the Extraction of a large Stone be cloſely conſider'd.

It may be obſerv'd, when a Stone is laid hold of by the *Forceps*, that both together, Stone and *Forceps*, from the Screw-pin to the former, form a complete Wedge; inſomuch that a Perſon in a forcible Extraction, can ſcarcely conceive the Power applied to the Bladder, or the Force with which it is diſtended. If the Diameter of the Stone be equal to a third Part of the Length of the Chops of the *Forceps*, a Force of ten Pounds applied to them will be to the Wound of the Bladder, equal to thirty; but how ſhocking muſt be the Caſe, when (either on account of the Magnitude of the Stone, or Narrowneſs of the Wound) a Man uſes his utmoſt Force, and many ſuch Inſtances in adult Bodies I have ſeen. The Power is then augmented by the Action of the Lever to two or three hundred; a Force no doubt ſufficient to reduce the Bladder and neighbouring Parts to Rags.

This

This is ſcarce to be credited; but there is too much Reaſon to believe, that the Want of Succeſs in Subjects arriv'd at adult Age, where the Stones are almoſt always large, is owing intirely to this very Circumſtance.

When all this Violence is inſufficient, there is at preſent no other eſtabliſh'd Method, than either to attempt the making a ſecond Inciſion on the Stone, as it is held in the *Forceps*, or to withdraw the latter, and to make it on the Bladder, in the flaccid State it then lies, without any Guide at all.

As to the firſt Method, it is evident the *Forceps*, Stone, and Bladder in Men are ſo much in the dark, that the Inciſion muſt be made with the utmoſt Difficulty; indeed it is hardly poſſible to cut at all with any Certainty.

The other Way of cutting on the Bladder when the *Forceps* is withdrawn is much worſe; for if it be remember'd, that the Bladder lieth upon, and is contiguous with the *Rectum*, and that they are both in the ſame flabby State, it will appear impoſſible to cut the one, without (at leaſt a very great Riſque of) wounding the other.

This manifeſt Defect in the Operation would be intirely removed, if there always was a Director for the Knife left in the Bladder; and this is ſo eaſily and completely to be done, that its great Simplicity ſeems to be the Reaſon it has not been attended to. If one Limb of the *Forceps*, from the Joint to its Extremity, be converted into a Staff, by making a deep Groove through its whole Length, it will better anſwer the End deſired, than if it were poſſible to ſuffer the Staff itſelf to remain in the Bladder

during the Operation; for, when a large Stone is laid hold of, and the *Forceps* of courſe much divaricated, inſomuch that the Extraction of the Stone is found to be impracticable with Safety, without a ſecond Inciſion on the Parts upon the Stretch; you then ſlide the Point of a narrow Knife on the Groove of the *Forceps* quite on into the Bladder, and it will divide the very Part which needs it moſt; whilſt the *Rectum*, on account of its flaccid State, will moſt certainly eſcape wounding. If the Wound is deſired to be but little larger, the *Forceps* muſt be but gently drawn forward when the Inciſion is made; but if, on the other hand, the Stone prove extremely large, the *Forceps* ſhould be then drawn forwards with a Force ſufficient to put the Bladder upon the Stretch; and by this Management the Dilatation may be made as great or little as is required.

As the common Knife is not ſo proper for this Purpoſe on account of its Breadth, I have got one made of a more convenient Form, with a Gorget-Handle and Button-Point, as in the *Bubonocele* Knife.

This Method, as it removes all Occaſion for Violence to the Bladder, will reduce the Effects of the Operation nearly to thoſe of a mere Inciſion only, which might, as now, ſometimes prove fiſtulous, but I believe ſcarcely ever mortal.

I would not be underſtood to mean that it ſhould be uſed in common Caſes, and moderate ſized Stones; no; Mr. *Cheſelden* has ſufficiently demonſtrated to the World, by Experiment, the Inconvenience of cutting beyond the Proſtate, when it can be avoided. I only ſay this, that where a large Stone offers, and the Circumſtances are ſuch, that the Operator is under a Neceſſity of tearing the Parts to Pieces,

Pieces, unleſs divided by an Inciſion, the latter is more ſafe and eligible.

The principal Advantages of this Contrivance are, 1. That the Degree of Dilatation is in the Operator's Power, to the greateſt Exactneſs: 2. That it will infallibly divide thoſe Parts only which are upon the Stretch; and for this Reaſon, 3. The *Rectum*, if it is empty, and conſequently flaccid, muſt certainly eſcape wounding. Its great Simplicity is another Circumſtance much in its Favour; for it ſeems allow'd on all Hands, the leſs an Operation is incumber'd with Inſtruments the better. In common Caſes, where the Aſſiſtance of this Method is not wanted, the *Forceps* is not the leaſt incommoded as to its general Uſe; but if the Stone prove large (which can never be certainly known till it is laid hold of), the Remedy is at hand.

Plimouth, Jan. 6. 1748-9.

John Mudge.

P. S.

Theſe *Forceps* and Knife are repreſented in TAB. I. *Fig.* 3, 4, 5.

Fig. 3. The *Forceps*, with the Knife, *a b*, applied to one of the Cheeks of it. *c*, the Button. *bfg*, the Handle.

Fig. 4. The Cheek of the *Forceps* with the Groove in it *de*.

Fig. 5. The Knife. The Blade *ab*; the Button *c*, made to fit, and ſlide along the Groove *de*; *bfg* the Handle; *cab* the ſharp Edge; *chf* the Back of the Knife, which muſt have the ſame Curve as the Back of the Cheek of the *Forceps* or Groove to which it is to be applied, as in *Fig.* 3.

C. M.

IX.

IX. *An Account of the* Locuſts, *which did vaſt Damage in* Walachia, Moldavia, *and* Tranſilvania, *in the Years* 1747 *and* 1748; *and of ſome Swarms of them, which, in the Months of* July *and* Auguſt 1748. *came into* Hungary *and* Poland; *by a Gentleman who lives in* Tranſilvania.

Read Feb. 2. 1748-9.

IT is certain that the Locuſts came into *Tranſilvania* from *Walachia* and *Moldavia*, and particularly thro' thoſe narrow Openings in the Mountains, which are commonly called Paſſes; the moſt conſiderable of which, in the Neighbourhood of *Clauſenburg*, is called the Paſs of the *Red Tower*, and thro' others not far from *Karlſtat*, which are common Roads from *Tranſilvania* into *Moldavia* and *Walachia*.

The firſt Swarms enter'd into *Tranſilvania* in *Auguſt* 1747: Theſe were ſucceeded by others, which were ſo ſurpriſingly numerous, that when they reached the *Red Tower*, they were full four Hours in their Paſſage over that Place; and they flew ſo cloſe, that they made a ſort of Noiſe in the Air, by the beating of their Wings againſt one another. The Width of the Swarm was ſome Hundreds of Fathoms, and its Height or Denſity may be eaſily imagined to be more conſiderable, inaſmuch as they hid the Sun, and darkened the Sky, even to that degree, when they flew low, that People could not know one another at the Diſtance of twenty Paces.

But

But whereas they were to fly over a River that runs in the Vallies of the *Red Tower*, and could find neither Reſting-place nor Food; being at length tired with their Flight, one Part of them lighted on the unripe Corn on this Side of the *Red Tower*, ſuch as Millet, *Turkiſh* Wheat, *&c.*; another Part pitch'd on a low Wood: Where having miſerably waſted the Produce of the Land, they continued their Journey, as if a Signal had been actually given for a March. The Guards of the *Red Tower* attempted to ſtop their Irruption into *Tranſilvania* by firing at them; and indeed where the Balls and Shot ſwept thro' the Swarm, they gave way and divided; but, having fill'd up their Ranks in a Moment, they proceeded on their Journey.

They are of different Forms, according to their different Ages: For when, in the Month of *September*, ſome Troops of them were thrown to the Ground by great Rains, and other Inclemency of the Weather, and thoroughly ſoaked with Wet, they crept along in queſt of Holes in the Earth, Dung, and Straw; where, being ſheltered from the Rains, they laid a vaſt Number of Eggs, which ſtuck together by a viſcid Juice, and were longer and ſmaller than what is commonly called an Ant's Egg, very like Grains of Oats. The Females, having laid their Eggs, die like the Silk-worm; and we *Tranſilvanians* found by Experience, that that Swarm which enter'd into our Fields by the *Red Tower*, did not ſeem to intend remaining there, but were thrown to the Ground by the Force of the Wind, and there laid their Eggs; a vaſt Number of which being turn'd up, and cruſhed by the Plough,

in

in the Beginning of the enſuing Spring yielded a yellowiſh Juice.

In the Spring of 1748. certain little blackiſh Worms were ſeen lying in the Fields and among the Buſhes, ſticking together, and collected in Cluſters, not unlike the Hillocks of Moles or Ants. As no body knew what they were, ſo there was little or no Notice taken of them; and in *May* they were cover'd by the ſhooting of the Corn ſown in the Winter. But the ſubſequent *June* diſcover'd what thoſe Worms were; for then, as the Corn ſown in the Spring was pretty high, theſe Creatures began to ſpread over the Fields, and become deſtructive to the Vegetables by their Numbers. Then at length the Country People, who had ſlighted the timely Warning given them, began to repent of their Negligence; for, as theſe Inſects were now diſperſed all over the Fields, they could not be extirpated without injuring the Corn.

At that time they differ little or nothing from our common Graſshoppers; having their Head, Sides, and Back of a dark Colour, with a yellow Belly, and the reſt of a reddiſh Hue. About the middle of *June*, according as they were hatch'd ſooner or later, they were generally a Finger's Length, or ſomewhat longer, but their Shape and Colour ſtill continued.

Towards the End of *June* they caſt off their outward Covering; and then it plainly appear'd that they had Wings, very like the Wings of Bees, but as yet unripe and unexpanded; and then their Body was very tender, and of a yellowiſh Green: Then, in order to render themſelves fit for flying, they gradually unfolded their Wings with their hinder Feet,

Feet, as Flies do. And as ſoon as any of them found themſelves able to uſe their Wings, they ſoared up, and, by flying round, the others provoked them to join them: And thus their Numbers increaſing daily, they took circular Flights of twenty or thirty Yards wide, until they were join'd by the reſt; and, after miſerably laying waſte their native Fields, they proceeded elſewhere in large Troops.

Whereſoever thoſe Swarms happen'd to pitch, they ſpared no Sort of Vegetable; they eat up the young Corn, and the very Graſs; but nothing was more diſmal to behold than the Lands in which they were hatch'd; for they ſo greedily devoured every green thing thereon, before they could fly, that they left the Ground quite bare.

There is nothing to be fear'd in thoſe Places to which this Plague did not reach before the Autumn; for the Locuſts have not Strength to fly to any conſiderable Diſtance, but in the Months of *July*, *Auguſt*, and the Beginning of *September*; and even then, in changing their Places of Reſidence, they ſeem to tend to warmer Climates.

Different Methods are to be employed, according to the Age and State of theſe Inſects; for ſome will be effectual as ſoon as they are hatch'd; others when they begin to crawl; and others, in fine, when they are able to fly. And Experience has taught us here in *Tranſilvania*, that it would have been of great Service, to have diligently ſought out the Places where the Females lodged; for nothing was more eaſy, than carefully to viſit thoſe Places in *March* and *April*, and to deſtroy their Eggs or little Worms with Sticks or Briars; or if they were not to be beat

out of the Buſhes, Dunghills, or Heaps of Straw, to ſet fire to them; and this Method would have been very ſpeedy, convenient, and ſucceſsful; as it has been in other Places. But in the Summer, when they have march'd out of their Spring-Quarters, and have invaded the Corn-fields, *&c.* it is almoſt impoſſible to extirpate them, without thoroughly threſhing the whole Piece of Land that harbours them, with Sticks or Flails, and thus cruſhing the Locuſts with the Produce of the Land.

Finally, when the Corn is ripe, or nearly ſo, we have found, to our great Loſs, that there is no other Method of getting rid of them, or even of diminiſhing their Numbers, but to ſurround the Piece of Ground with a Multitude of People, who might fright them away with Bells, braſs Veſſels, and all other Sorts of Noiſe. But even this Method will not ſucceed, till the Sun is pretty high, ſo as to dry the Corn from the Dew; for otherwiſe they will either ſtick to the Stalks, or lie hid under the Graſs. But when they happen to be driven to a waſte Piece of Ground, they are to be beat with Sticks or Briars; and if they gather together in Heaps, Straw or Litter may be thrown over them, and ſet on fire. Now this Method ſerves rather to leſſen their Numbers, than totally deſtroy them; for many of them lurk under the Graſs or thick Corn, and in the Fiſſures of the Ground from the Sun's Heat: Wherefore it is requiſite to repeat this Operation ſeveral times, in order to diminiſh their Numbers, and conſequently the Damage done by them. It will likewiſe be of Uſe, where a large Troop of them has pitch'd, to dig a long Trench, of an Ell in Width and Depth,

and

and place ſeveral Perſons along its Edges, provided with Brooms, and ſuch-like things, while another numerous Set of People form a Semicircle, that takes in both Ends of the Trench, and encompaſſes the Locuſts, and, by making the Noiſe above-mentioned, drive them into the Trench; out of which if they attempt to eſcape, thoſe on the Edges are to ſweep them back, and then cruſh them with their Brooms and Stakes, and bury them, by throwing in the Earth again.

But when they have begun to fly, there ſhould be Horſemen upon the Watch in the Fields, who, upon any Appearance of the Swarm taking Wing, ſhould immediately alarm the Neighbourhood by a certain Signal, that they might come and fright them from their Lands by all Sorts of Noiſe; and if, tired with flying, they happen to pitch on a waſte Piece of Land, it will be very eaſy to kill them with Sticks and Brooms, in the Evening, or early in the Morning, while they are wet with the Dew; or any time of the Day in rainy Weather, for then they are not able to fly.

I have already taken notice, that, if the Weather be cold or wet in Autumn, they generally hide themſelves in ſecret Places, where they lay their Eggs, and then die: Wherefore great Care ſhould be taken at this time, when the Ground is freed of its Crop, to deſtroy them, before they lay their Eggs.

In this Month of *September* 1748. we received certain Intelligence, that ſeveral Swarms of Locuſts came out of *Walachia* into *Tranſilvania* thro' the uſual Inlets, and took Poſſeſſion of a Tract of Land in the Neighbourhood of *Clausberg*, near three

Miles in Length; where it was not poſſible to ſave the Millet and *Turkiſh* Wheat from theſe Devourers.

I am of Opinion, that no Inſtances of this kind will occur in our Hiſtory, except what ſome old Men remember, and what we have experienced; at leaſt there is no Account, that any Locuſts came hither, which did not die before they laid their Eggs; however, this is a known Fact, that, about forty Years ago, ſome Swarms came hither out of *Walachia*, and did vaſt Damage where-ever they ſettled; but either left this Country before the End of Summer, or died by the Inclemency of the Weather.

Perhaps better Remedies may be had from other Countries, where this Evil is more common, againſt next Spring; for the Winter Seaſon is very ſafe from this Plague.

The Gentleman, to whom the foregoing Account was ſent from *Tranſilvania* to *Vienna*, and who tranſmitted it hither, has alſo informed us, that a conſiderable Number of theſe Locuſts had alſo come within twenty Leagues of that City; and that one Column of them had been ſeen there, which was about half an Hour's Journey in Breadth; but of ſuch a Length, that, after three Hours, tho' they ſeemed to fly faſt, one could not yet ſee the End of the Column. The Eggs of theſe Animals, which have been preſerved in dry Mould, have produced nothing; but thoſe that have been preſerved in Mould that was moiſtened with Water from time to time, gave early in the Spring of 1749. ſome of theſe Graſshoppers. The little ones were, ſoon after they came forth, of the Size nearly of ordinary Flies: They had already the Form of Graſshoppers,

theſe

but they had as yet no Wings. This Obſervation ſhews, that the Author of the foregoing Account was miſtaken, when he ſays, "Theſe Inſects had at firſt "the Form of Grubs, or ſmall Worms." They change their Skin ſeveral times, but they do not acquire Wings till they have changed for the laſt time.

The Graſshoppers that were taken in *England* in 1748. have been compared with thoſe that have been ſent over from *Hungary* and from *Poland* that ſame Year, and they have been found to be perfectly of the ſame kind. There are in Sir *Hans Sloane*'s Collection * ſome of the ſame ſort of Locuſts or Graſshoppers, preſerved in Spirits of Wine, and which were taken up here above thirty Years ſince, and are exactly like thoſe from *Egypt* and *Barbary*.

X. *A Letter from Mr.* Henry Baker *F.R.S. to the* Preſident, *concerning ſome* Vertebræ *of* Ammonitæ, *or* Cornua Ammonis; *communicated to Mr.* Baker *by the Rev. Dr.* Miles *F.R.S.*

SIR,

Read Feb. 9. 1748-9. I HAVE now the Honour to lay before you a curious and moſt extraordinary Foſſil, which was lately ſent to me for that Purpoſe by my worthy Friend Dr. *Miles*, of *Tooting*, *F.R.S.* It conſiſts of 26 Joints, which he calls *Vertebræ*, and I believe ſuppoſes to have been the Joints of the Back-Bone or Tail of ſome Animal; but, upon conſidering

---

* See Sir *Hans Sloane*'s Hiſt. of *Jamaica*, vol. I. p. 29.

ſidering them with Attention, they will perhaps rather be judged to be the ſeveral articulated Diviſions that compoſe the Body of ſome kind of *Nautilus*, or of ſome one or other of the various Species of the *Ammonitæ:* Which Opinion is I think ſupported, not only by the ſpiral Figure, which they form when put together, but likewiſe by the Traces or Markings of ſuch-like Articulations, found on ſome particular Kinds of foſſil *Nautili* and *Ammonitæ*; one whereof I alſo lay before you, as a Proof of this Conjecture.

You will obſerve all the Parts of this uncommon Foſſil are converted into a ſort of ſparry Subſtance, and that they are articulated with one another in an exact and beautiful Order. I have faſtened them together in two Diviſions, that they may be examined more eaſily than they could be, if they were all ſeparate, and in Confuſion: And indeed I am not quite ſatisfied that theſe two Bundles belonged both to the ſame individual Animal; if they did, ſome Joints muſt be wanting that came between them, and united them together, as the two Ends do not at preſent match: And what makes me ſuſpect they did not, is a different Articulation to be obſerved on one Side of that Diviſion made up of the largeſt Joints: Beſides, the whole Number appears rather too much, and the ſmaller Joints ſeem to make up a Body whoſe Figure is nearly perfect.

Strand, Feb. 9. 1748-9. *Your moſt obedient humble Servant,*
H. Baker.

See TAB. II.

Fig. 1. The larger Joints.
Fig. 2. The ſmaller Joints.
Fig. 3. and 4. The fore and back Side of a ſingle Joint.

P. S.

P. S. Dr. *Miles* ſays they belong to Dr. *Clark* of *St. Alban's*; that they were found in *Oxfordſhire*, and were formerly in the Poſſeſſion of the late Mr. *William Becket* Surgeon, *F. R. S.*

XI. *The Caſe of Mr.* Smith, *Surgeon, at* Sudbury *in* Suffolk; *the Coats of whoſe* Stomach *were changed into an almoſt cartilaginous Subſtance; communicated by the Rev. Mr.* Murdock *to* Cromwell Mortimer *M. D. Secret. R. S.*

Rev. Sir, *Clare*, Oct. 11, 1747.

Read Feb. 9. 1748-9. AGreeable to your Deſire I ſend you the material Particulars of Mr. *Smith's* Caſe. As there was ſomething uncommon in it, and as it may be for the Benefit of Mankind, which was the Deſign, and a generous one it was, of my deceaſed Friend, in reſolving a good while before his Death to be opened, I ſhall take it as a Favour that you will communicate it to Dr. *Mortimer*. I could not, for the Thing ſtruck me very ſtrongly, forbear making a few Remarks: But I leave it intirely to your Diſcretion to ſuppreſs or ſend them with the Caſe. I am,

Dear Sir,

Yours moſt ſincerely,

J. Sayer.

The

The CASE.

HE was in the vigorous Time of Life, being no more than thirty-ſix Years of Age; and, to all Appearance, of a ſtrong well-ſet Habit. His Way of living was quite regular; but his Practice of Midwifry, which was pretty large, often forced him in ſevere Weather from a warm Bed into bad Roads, and ſometimes into raw uncomfortable Houſes.

He had for ſeveral Years complained of Uneaſineſs at his Stomach; but it was not conſiderable, till about *January* 1746-7. From that time, he almoſt conſtantly threw up his Food within an Hour or two after taking it, and he felt violent Pain about the *Scrobiculus Cordis*. Divers Phyſicians were adviſed with, but Medicines availed him nothing; nor had he any Eaſe, except from Opiates, or ſpirituous Liquors; and this was of ſhort Continuance.

It being, in the *September* following, recommended to him to go to *Bath*, he for ſome Weeks drank the Waters, and afterwards bathed. The firſt had no remarkable Effect; but he found himſelf worſe after bathing. Upon his Return home, new Phyſicians were conſulted, and new Methods were tried, but to no purpoſe; and, to make Life tolerable, he was forced to be very free in the Uſe of ſpirituous Liquors and Opiates.

In *February* 1747-8. he voided, by two or three Stools, about a Couple of Ounces of Matter. Some Weeks before his Death the Pains went off, and his Vomiting was at times ſtay'd; but whenever that happen'd, whatever he took ran directly through but

him. And indeed he was now-and then, during the whole Illneſs, ſubject to bilious Dejections.

On this Remiſſion of the Symptoms, his Friends flatter'd themſelves yet that all might do well; but his Waſting, which had long began, continued; and his Legs, eſpecially one of them, became œdematous. After growing gradually weaker, till Nature was quite ſpent, he expired, with the utmoſt Serenity of Mind, in the Evening of *Auguſt* the ſeventh.

His Body being, purſuant to his Requeſt, opened in the Preſence of Dr. *Scarling*, and three or four Surgeons, the Coats of the Stomach were found chang'd into an uniform, white, inelaſtic, almoſt cartilaginous Subſtance, which was four Tenths of an Inch in Thickneſs. Beſides this ſtrange Alteration in its Coats, the Stomach was ſo contracted, as to be incapable of holding more than five or ſix Ounces; and its inner Surface was beſmeared with a various-colour'd Matter. The reſt of the *Viſcera* ſeemed to be quite unaffected, and every thing was in its natural Situation, except the *Omentum*, which, beſides being, as it is in all tabid Bodies, vaſtly waſted, was neceſſarily drawn upwards by the Contraction of the Stomach.

Remarks.

It is highly probable, that this Gentleman's Diſorder, whether conſtitutional or acquired, was at firſt an Obſtruction in thoſe Glands, which ſeparate the Humour that ſerves to defend the villous Coat from the Acrimony of what is taken into the Stomach, and to prevent its being ſtimulated by

the Aliment in Digeſtion; for want of which it was ſo ſubject to Irritation, that ſcarce any thing would ſtay upon it. The Matter voided by Stool was undoubtedly formed in the Stomach, becauſe he never complained of conſiderable Pain in any other Part; beſides, had it been from an Abſceſs in the Inteſtines, or any other of the *Viſcera*, the Seat of it would in all Likelihood have been apparent. The Looſeneſs, which in the latter Part of his Illneſs, always attended him when the Vomiting ceaſed, plainly ſhews, that the Stomach had at that time acquired a great if not its greateſt Degree of Contraction; for which Reaſon, as it could contain but little, any Quantity of Food muſt, if not thrown up, go immediately downwards. The going off of the Pain ſome Weeks before his Death, was owing to the Senſibility of the Coats of the Stomach being in a great meaſure, or quite deſtroyed. The bilious Dejections, that frequently attended him, may be aſcribed to Want of Digeſtion; which, as little or no Chyle was ſent into the *Duodenum*, rendered the Bile uſeleſs. The Conſequence of this was a Non-ſecretion of that Humour, an Accumulation of it in the Liver, or Gall-bladder; its being reconveyed into the Blood; or its going off by Stool. If the firſt or third had been the Caſe, it would have ſhown itſelf in a Jaundice; if the ſecond, there would have been an Abſceſs in the Liver or Gall-bladder; ſo that of courſe it muſt run off by Stool. Spirituous Liquors might help to bring on this Contraction, Inelaſticity, and Inſenſibility of the Stomach: But it ſeems pretty clear that they were not the ſole Cauſe; elſe immoderate Drinkers of them would generally be affected in the ſame Manner.

XII.

XII. *A* Catalogue *of the* Fifty Plants *from* Chelsea-Garden, *presented to the* Royal Society *by the Company of* Apothecaries, *for the Year* 1746. *pursuant to the Direction of Sir* Hans Sloane *Bart. Med. Reg. & nuper Soc. Reg. Præs.*; *by* Jos. Miller *Apothecary*, *Hort.* Chels. *Præs. ac Prælect. Botan.*

Presented Feb. 16. 1748-9.

1201. Adiantum Americanum. *Cornut.*
1202. Adiantum nigrum. Offic.
1203. Acriviola maxima odorata, flore pleno. *Boerh.*
1204. Alaternoides Africana Telephii *Imperati* folio. *Hort. Amst.*
1205. Alnus nigra. *Offic.*
1206. Aquilegia hortensis multiplex, flore pleno. *C. B.*
1207. Arum maximum, quod Colocasia vulgò caulibus nigricantibus. *Hort. Lugd.*
1208. Asperula odorata, flore albo. *Offic.* et *Dodon.*
1209. Asteriscus perennis maritimus patulus. *Tourn.*
1210. Buphthalmum orientale, Tanaceti minoris folio, flore luteo amplo. *Ibid.*
1211. Calendula minor Hispanica. *Hort. Lugd. Bat.*
1212. Chamæpitys lutea vulgaris, folio trifido. *C. B.* et *Offic.*
1213. Clinopodium minus, Ocimi facie. *C. B.*
1214. Clinopodium Americanum rotundifolium, Pulegii odore. *Houst.*

3

1215. Convolvulus cæruleus major, folio ſubrotundo. *Ger. Park.*
1216. Conyſa minima. *Ger. emac.*
1217. Corona Solis annua, flore pleno. *Tourn.*
1218. Coronilla herbacea, flore vario. *Ibid.*
1219. Euphraſia pratenſis rubra. *C. B.*
1220. Galega Africana, floribus majoribus, et ſiliquis craſſioribus. *Tourn.*
1221. Geranium Africanum Malvæ folio, petalis florum inferioribus vix conſpicuis. *Index Hort. Chelſ.*
1222. Guidonia Ulmi foliis, flore roſeo. *Plum.*
1223. Helianthemum vulgare, flore luteo. *J. B.*
1224. Horminum coma purpureo-violacea. *Ibid.*
1225. Jacea ſpinoſa alata, cinerea caule, ſpinis luteis longiſſimis.
1226. Lavatera, folio et facie Altheæ. *Act. Reg. Soc.*
1227. Lavatera flore albo.
1228. Lotus anguſtifolia flore luteo-purpureo, ex inſula Sancti Jacobi. *Hort. Amſt.*
1229. Lychnis ſylveſtris flore albo minimo. *Raii Hiſt.*
1230. Lychnis ſylveſtris, quæ Saponaria. *Tourn.*
1231. Meſpilus aculeata, Pyri denticulato folio, ſplendens Virginiana. *Pluk.*
1232. Myagrum ſiliculis longis. *C. B.*
1233. Myrtus latifolia Romana. *Ibid.*
1234. Myrtus Buxi folio. *Schyl. Hort.*
1235. Obeliſcotheca minor, integro folio. *Dillen.*
1236. Ophioglosſum, Lingua ſerpentina. *Park.*
1237. Ophris bifolia. *C. B.*
1238. Orobus ſylvaticus, Viciæ foliis. *Ibid.*

1239.

1239. Pæonia mas. *Officin.* et *C. B.*
1240. Phaſeolus flore coccineo. *Cornut.*
1241. Piſum humile caule firmo. *Tourn.*
1242. Polemonium vulgare. *Ibid.*
1243. Rapuntium maximum, coccineo ſpicato flore. *Col. in Rech.*
1244. Rhamnus catharticus. *Off.* et *C. B.*
1245. Satureia hortenſis æſtiva. *Ibid.*
1246. Sclarea Indica flore variegato. *Boerh.*
1247. Saururus humilis, folio carnoſo ſubrotundo. *Plum.*
1248. Spiræa Hiſpanica, Hyperici crenato folio. *Tourn.*
1249. Thuya Theophraſti. *C. B.*
1150. Turritis muralis hirſuta minor. *Tourn.*

XIII. *The Reverend Mr.* Robert Clarke *to Mr.* Fleming, *concerning a Boy, who had a* Calculus *formed between the* Glans *and the* Præputium.

SIR,

Read Feb. 23. 1748-9. UPON Inquiry, I find that the Boy you deſire to have an Account of, from his Infancy labour'd under the Difficulty of making Water; for tho' he was three Years of Age, when put under the Care of the Perſon from whom I have this Intelligence, yet he could not go alone. He was in the greateſt Agony upon every Motion; but was relieved by putting a great Pin, the Head foremoſt,

foremoſt, an Inch, at leaſt, between the Prepuce and the Stone; when ſometimes a mucous, ſometimes a gritty Matter, would firſt ouze out, and then came the Urine with ſome Violence.

During this time, the End of the *Penis* was obſerved to grow in the Form of, and as big as, a Hen's Egg; occaſioned, as may be imagined, by the Concretion of the Stone between the *Glans* and the *Prepuce*. At laſt there was a total Suppreſſion of Urine for 48 Hours at leaſt, attended with an Appearance of a Sore in the Side of the *Penis*, out of which the ſtony Concretion which I gave you dropp'd; and from that time, all the while the Boy continued under the ſame Perſon's Care, which was about half a Year, the Urine was diſcharged at the Side, with leſs and leſs Pain. Laſt Summer he came to ſee his *quondam* Nurſe, and told her that he was now perfectly well. His Age now is about 23. His Name *John Blackhouſe*. I am,

SIR,

Houghton Conqueſt, Jan. 21. 1748-9.

Your very humble Servant,

Robert Clarke.

XIV. *The Eſtabliſhment of a new* Genus *of* Plants, *called* Salvadora, *with its Deſcription*; *by* Laurence Garcin *M. D. F. R. S. of* Neufchatel *in* Switzerland; *communicated in a Letter to Dr.* Mortimer *Secr. R. S.*

Tranſlated from the French, *by* T. Stack *M. D.*

Read Feb. 23. 1748-9.

THIS Plant is woody. It grows ſometimes into a Tree, ſometimes into a Shrub, and ſometimes into a Buſh; ſpreading very tufted Branches on all Sides down to the Ground. Its native Countries are the Parts adjacent to the *Perſic Gulph*, the North of *Arabia*, and the South of *Perſia*. I cannot find that any Author has known, or made the leaſt mention of it.

Firſt I will give its Characters, and then its Deſcription from accurate Obſervations, which I have made on the Spot.

Characters.

Calix. This is a monophyllous Cup, divided into four Lobes, which, as ſoon as they ſpread open, turn outward, and roll backward on themſelves; then wither, grow whitiſh, and dry up.

Corolla. Its Flower is void of Petals.

Stamina. Theſe are four in Number, anſwering to the four Lobes of the *Calix*, and being likewiſe of the ſame Length. They ſpring from the Baſis of the *Piſtillum*, and, as they ſhoot up, tend outward.

Their

Their Summits are round, with a Furrow turning in on one Side; which gives each of them the Form of a Purſe.

Piſtillum. It is round, its Style ſingle and ſhort, and the *Stigma* is blunt, and ſhaped like a Navel.

Pericarpium. Is a round Berry, of a middle Size, with one Cell or Lodgment in it.

Semen. It is ſingle, ſpherical, incloſed in a callous firm Skin, beſet with Spots, forming a ſort of Husk like that of Hemp.

I know but one Species of this *Genus,* which I deſcribe thus.

Deſcription.

It is a Plant which varies conſiderably in Size; that of a larger ſort of Shrub, is what it moſt frequently grows to. It produces a Number of Boughs without Order, and very tufted Branches, which moſt commonly hang down to the Ground. Its Bark is moderately thick, ſometimes ſmooth, ſometimes full of Cracks, of an Aſh-colour, both in the Trunk and Branches, but green on the tender Shoots. Its Wood is every-where brittle, and nearly of a Straw-colour.

The Leaves are borne on young Sprigs, which ſhoot out along the Boughs. Theſe Sprigs are ſtrait, generally ſhort, but ſometimes pretty long, like little Wands. The Leaves are thick-ſet, and tufted on the former, but thin on the latter. They grow ſometimes oppoſite to one another by Pairs, croſſing alternately; and ſometimes by three and three, diſpoſed like Rays; but this more rarely. Their Length, which varies on the ſame Stalk, is generally from

from an Inch and half to two Inches and half, and their Width is from nine Lines to an Inch a little below the Middle in each, which is the wideſt Part. They are thick, pointed at their Extremity, and rounded at their Baſe, very even on their Edges, ſomewhat ſucculent, but firm: Their Colour is a pale Green, but ſomewhat yellowiſh, in thoſe that are ſhooting out. The Pedicles which ſupport them are very ſhort, each being but half a Line in Length, and a quarter in Thickneſs. Every one of theſe Pedicles, which is round, furniſhes a little Nerve, which runs thro' the middle of the Leaf; it is a little hollowed on the upper Side, and ſomewhat raiſed on the Back; and terminates at the End of its reſpective Leaf. This Nerve gives two or three Pair of almoſt imperceptible Threads, which ſpread and divide into other ſmall irregular Threads, thro' the Body of the Leaf. In fine, theſe Leaves in Shape nearly reſemble thoſe of the Sea-Purſlain, and ſometimes thoſe of the Miſletoe of the Apple-tree. There are ſome generally on each Plant, which have one, two, or more black Spots, as in the *Perſicaria*, but almoſt round, and ſmaller.

The Flowers, which are ſtamineous, that is, without Petals, are ſmall, and diſpoſed in Cluſters on the Tops of the Shoots. Theſe Bunches of Flowers intirely reſemble thoſe of the Vine-Bloſſoms. The Empalement is ſmall, green on the under Side, having four Segments almoſt pointed, which roll outward, and then dry up. Its Diameter in this rolled State of its Lobes, is but of one Line. The *Stamina* are of a Straw-colour. The hollow Furrow in each

of their Summits is not eaſily diſcover'd without a Glaſs.

The Piſtil or *Embryo* of the Fruit, which is little, and yet occupies the whole Inſide of the *Calyx*, is of the ſame Colour with the Bottom of this, that is, green. Afterwards it ſwells in all Dimenſions, and grows into a Berry, of the Shape and Size of a Gooſeberry, of three or four Lines in Diameter. At firſt it is of a pale Green, then a bright Purple, and in its Maturity of a dark Red. Each Berry is ſupported on a ſtrong thick Pedicle, attached to a ſmall Bunch. Its Subſtance is a white tranſparent Fleſh, full of Juice, much reſembling Jelly, which ſurrounds a ſingle round Grain, marbled with black or brown Spots, as in the Tortoiſe-ſhell, when ripe. This Grain is as large as a Grain of Hemp-ſeed, that is, about two Lines in Diameter, but ſometimes leſs. It is properly a Kernel, or a Shell that has a Cavity, which incloſes a ſort of little round Almond, of a Straw-colour, yellowiſh on its outward Surface, and pale in its inward Subſtance, which is pretty firm.

Qualities.

All the Parts of our Plant have an acid pungent Taſte and Smell, vaſtly like our Garden-Creſſes, but more biting. The Fruit is the moſt pungent Part of the Whole. The Smell of the Plant is perceptible at ſeven or eight Paces Diſtance, when a Perſon is to Leeward.

The Natives of the Country uſe it againſt the Bite of the Scorpion, by rubbing the wounded Part with its bruiſed Leaves. They alſo employ its warm Infuſion to waſh the Bodies of their Children, in order

to

to keep them healthy. And they feed Camels with it, who love it naturally.

Remarks.

This Shrub, which is ſometimes large, ſometimes ſmall, is moſt commonly found along high Roads, and in dry low Places of its Climate. As its Branches, which are ſlender and brittle, ſpontaneouſly bend downward, and form a thick Tuft, this makes it generally reſemble a great Buſh, which takes up a good deal of Ground in moſt Places, where it grows naturally. It delights in the hotteſt and drieſt Places, ſuch as thoſe adjacent to the *Perſic Gulph*, and perhaps more ſo than Palm-Trees: Wherefore I doubt of there being any growing in the Countries that lie to the Eaſt of the *Gulph*. And accordingly I have met with none, either in the Neighbourhood of *Surat*, or in the Kingdom of *Bengal*, where there are regular rainy Seaſons every Year.

I ſhould rather believe, it is more likely to be found in the Deſerts of *Africa*, on this Side of our Tropic; thoſe being proper Places for it, and where it rains ſeldomer than in any other Part of the Globe.

Its Leaves have frequently Excreſcences of different Sizes and Shape, round, oval, and ſometimes very large. They are the Work of thoſe flying Inſects, which commonly abound in theſe Parts.

The Inhabitants of the *Gulph* call this Shrub by the Name of *Tchuch*. Perhaps its Nature would not allow it to grow in Lands far diſtant from the Sea, no more than the *Sea-Plants*, to which this Surname is given for that Reaſon.

Its Parts are all brittle, and even the Leaves crack, if bent in the Middle.

In fine, I have chosen a Name, which I imagined I ought to give it, after the Example of Mr. *Linnæus*, who has called several Plants by the Names of Botanists of Reputation. This laudable Proceeding is a Way to perpetuate the Memory of all those who have contributed to the Progress of Botany; and that much better than Medals do with regard to Princes or Emperors. A Proceeding, which, if duly pursued, will encourage those who come after us, to make useful Discoveries in this Science for the Good of Mankind, and in much greater Number than have been published on the Subject of Plants up to our Times. For it is easy to comprehend, that what remains to be discovered on this Subject for our Use, must infinitely surpass all that Man has hitherto found out.

The Name of *Salvadora*, which I have chosen for our Shrub, is that of the late Mr. *Salvador* of *Barcelona*, a very skilful Botanist, of whom Monsr. *de Tournefort* makes mention in his Introduction, which serves for a Preface to his *Institutiones rei herbariæ*, where he styles him *the Phœnix of his Nation*; because he was really the richest Naturalist, and the most expert in botanical Matters that *Spain* ever produced. Before the last Siege of *Barcelona*, in the Years 1713 and 1714 they herborized together in *Catalonia*, and on the *Pyreneans*, while M. *de Tournefort* was on his Travels there. They were intimate Friends, and carried on a Correspondence some Years: And as I was personally acquainted with him for three or four Years, and have likewise

likewiſe herborized with him before the ſaid Siege, and have ſince been honoured with his Friendſhip and Correſpondence, I thought it incumbent on me to do Honour to his Memory, by giving his Name to this Plant. And I have done it with the greater Juſtice, becauſe it is certain, that, had he lived, he would have given a Hiſtory of the Plants of *Spain*, which, by its Accuracy, would have afforded much Pleaſure to the Botaniſts of *Europe*.

To conclude; from the Characters of our *Salvadora* it is manifeſt, that its Place in *Tournefort*'s Syſtem ought to be in the firſt Section * of the 18th Claſs. In the Syſtem of Mr. *Linnæus* it ought to be placed after the *Rivina* in the fourth Claſs, which receives Plants with four *Stamina* (*Tetrandria* and *Monogynia*).

---

* Among Trees and Shrubs having *apetalous* Flowers with the Fruit joined to them; to which Section belong the *Fraxinus* and the *Siliqua*. *C. M.*

XV. *A State of the* Engliſh *Weights and Meaſures of* Capacity, *as they appear from the Laws as well ancient as modern; with ſome Conſiderations thereon; being an Attempt to prove that the preſent* Avoirdepois *Weight is the* legal *and* ancient Standard *for the Weights and Meaſures of this Kingdom; by* Samuel Reynardſon *Eſq; F. R. S.*

Read March 9. 1748.

IT is declared by (1) *Magna Charta* that there ſhould be, throughout the Realm, one Meaſure of *Wine* (2), one of *Ale*, and one of *Corn*; *viz.* the *Quarter* (3) of *London*; and that it ſhould be of *Weights* as of *Meaſures*.

This Declaration has been repeated in many ſubſequent Laws (4), and by ſeveral of them the Treaſurer is directed to provide Standards of *Buſhels, Gallons,*

---

(1) *c.* 25.

(2) Biſhop *Fleetwood* ſays, it was a good Law of king *Edgar*, that there ſhould be the ſame Weight and the ſame Meaſures throughout the Realm, but it was never well obſerved. *Chron. pretioſum*, *p.* 34. — And, 2 *Inſt. p.* 41. ſays, This Law was grounded upon the Law of God, *Deut.* xxv. *ver.* 13, 14. — and that there were good Laws for Weights and Meaſures made before the Conqueſt by *Canute*. See *Cuſtum. de Norm.* c. 16.

(3) *See* p. 64. of this *Tranſact.* the Contents of a Quarter.

(4) 51 *H.* III. *St.* 6. 14. 25, and 27. *Ed.* III. 13, 15, and 16 *R.* II. 9 *H.* VI. 11 *H.* VII. *c.* 4. 16 *Car.* . and 22 *Car.* II *cap.* 8.

Gallons, and *Weights*, of *Braſs*; and to ſend them into every County; and all Meaſures are to be made according to the King's Standard; the *Aſſize* whereof is eſtabliſhed by ſeveral Laws (1), as follows: 'The 'Engliſh Peny, called a Sterling round, without 'clipping, to weigh 32 Grains of Wheat dry, and 'taken from the midſt of the Ear. 20 Pence make 'an Ounce. 12 Ounces a Pound. 8 Pounds make 'a Gallon of *Wine* (2). 8 Gallons of Wine make 'a *London* Buſhel (3), which is the eighth Part of a 'a Quarter.' And by other Laws (4) it is declared, 'That the Tun of Wine, Oil, and Honey, ſhould 'contain, of the *Engliſh* Meaſure, according to the 'antient Aſſize, 252 Gallons; the Pipe or Butt 126; 'The Tertian 84; the Hogſhead 63; and every Barrel $31\frac{1}{2}$, according to the *old Aſſize*, and to be 'gaged by the King's Gager.'

In the Reign of *Edward* III. (5) an Act paſſed to take away the Weight called *Ancell* (6), whereby, and by ſubſequent Statutes, it is directed, that every Sale and Buying ſhould by the even *Balance*.

In

---

(1) 51 *H.* III. *St.* 1. *c.* 3. 31 *Ed.* I. 12 *H.* VII. *c.* 5.

(2) The 12th *H.* VII. *c.* 5. ſays Wheat.

(3) 9 *H.* VI. *c.* 8. ſays — Buyers of Corn in *London* bought by a Veſſel called a Fat, containing 9 Buſhels of Corn; which is forbid by the Act.

(4) 2 and 18 *H.* VI. 1 *R.* III. *c.* 13. 5 *Ann. c.* 27 § 19. 23 *H.* VIII. *c.* 7. 2 *H.* VI. *c.* 11.

(5) 25 *Ed.* III. *St.* 5. *c.* 9. 34 *Ed.* III. *c.* 5. 8 *H.* VI. *c.* 5. 9 *H.* VI. *c.* 8.

(6) King *Stephen* (ſays *Knighton*) ſettled Meaſures of Length and of Land, and made Appointments *de Anſulis*, *Bilancibus*, &c. *Decem Scriptores*, *p.* 2391.

In the 11th Year of *Hen.* VII. Complaint being made to the Parliament, that the ancient Statutes and Ordinances of the Realm relating to Weights and Meaſures had not been obſerved and kept, it was therefore Enacted, ‘ That there ſhould be deli-
‘ vered to the Knights and Citizens of every Shire
‘ and City, one of every Weight and Meaſure, which
‘ the King had cauſed to be made of Braſs, accord-
‘ ing to his Standard in the Exchequer, to be deli-
‘ vered to the reſpective Places mentioned in the Act;
‘ and that the Inhabitants of all Cities, Boroughs,
‘ and Market-Towns, ſhould make and uſe *Weights*
‘ and *Meaſures* made according to the Weights and
‘ Meaſures ſo delivered as aforeſaid.” In the next Year another Act paſſed, reciting, ‘ That the King
‘ had made ſuch Weights and Meaſures of Braſs, ac-
‘ cording to the *old* Standard thereof remaining within
‘ his Treaſury; which Weights and Meaſures, upon
‘ more diligent Examination, had been *approved*
‘ defective, and not made according to the Statutes
‘ and *old Laws*, and were therefore recalled, and
‘ ordered to be broken, and other new Buſhels and
‘ Gallons were directed to be made and *ſiſed*, ac-
‘ cording to a new Buſhel and Gallon to be made
‘ according to the *Aſſize*, to remain in the King’s
‘ Exchequer:’ Where we now find a *Buſhel* in the Cuſtody of the Chamberlains called the *Wincheſter* Buſhel (1), and a Gallon agreeing thereto: Upon the Buſhel

(1) The firſt time I find it ſo called by any Law, is in an Act 22 *C.* II. *c.* 8.: And afterwards it is called by this Name in ſeveral Acts of Parliament; but in the Act juſt now mentioned, it is ſaid

Buſhel there is the following Inſcription; *Henericus ſeptimus Dei gratia Rex Angliæ et Franciæ.*

In the laſt-mention'd Act, the *Aſſiſe* for Weights and Meaſures is in Subſtance the ſame as in the *old* Statutes, only the Pound is ſaid to be the *Pound Troy* of 12 Ounces. But ſince by this and the former Aſſiſe Laws the Pound is directed to be raiſed from 240 Sterling Penies, it follows, that the Gravity of the Aſſiſe Pound was always the ſame; but the Dimenſions of Meaſures of Capacity reſpectively raiſed from a Pound of Wine, and a Pound of Wheat, will be in proportion to each other as the ſpecific Gravity of Wheat to that of Wine or Water.

Thus continued the Laws relating to the *Engliſh* Standard of Weights and Meaſures till after the Reſtauration; when a Duty of Exciſe (2) being laid upon Beer, Ale, and other Liquors, 36 Gallons taken by the Gage, according to the Standard of the Ale-Quart, (4 whereof made the *Gallon* remaining in the *Exchequer*) were to be reckoned as a Barrel of Beer, and 32 ſuch Gallons a Barrel of Ale; and afterwards (3) 34 ſuch Gallons of Vinegar (and of Beer or Ale ſtronger or ſmall without the Bills of Mortality) were declared to be a Barrel; and all other Liquors liable to

---

ſaid to be *commonly* called the *Wincheſter* Meaſure. Perhaps it firſt took that Name from the Statute made at *Wincheſter* 16 *R.* II. which directs the Clerk of the Market to have all his Weights and Meaſures ready, and marked and ſigned according to the Standard of the Exchequer.

(2) 12 *C.* II. *c.* 24. § 20.

(3) 1 *W.* and *M.* *c.* 24. § 5. 10 *W.* III. *c.* 21. 11 and 12 *ditto*, *c.* 15.

to the Exciſe-Duty were to pay according to the *Wine Gallon.*

We now find the Officers of the Revenue determining the Contents of our Meaſures of Capacity with great Exactneſs: For, on the 25th of *May* 1688, two general Officers of the Exciſe, in the Preſence of the Lord-Mayor, the Commiſſioners of Exciſe, Mr. *Flamſtead*, and others, upon an exact Trial found that the *old Standard Wine Gallon*, kept in *Guildhall*, did contain but 224 cubic Inches; nevertheleſs, at that time it was thought convenient to continue the former ſuppoſed Content, being 231 cubic Inches, as the *Standard Wine Gallon*, and which has ſince been eſtabliſhed by a Law (1).

In the Year 1696, an Experiment was made, in order to fix the true and exact Contents of the Braſs *Standard Buſhel* of *Henry* VII. which being filled with common Spring-Water, and the Water meaſured out with great Nicety and Exactneſs; the Buſhel (2) was found to contain 2145,6 ſolid or cubic Inches; and the Water being weighed by the Standard Weights in the Exchequer (and by a Beam, which would turn with ſix Grains put into either Scale, with 30 Pounds in each Scale) was found equal to 1131 Ounces 14 Penyweights *Troy*; and at the ſame Time and Place the Standard *Troy* Weights were compared with the Standard *Avoirdepois*, and 15 Pounds

(1) 5 *Ann. c.* 27. § 17. — This Act ſays, Any Cylinder 7 Inches Diameter, and 6 Inches deep, or any Veſſel containing 231 cubical Inches, and no more, ſhall be a lawful Wine-Gallon.

(2) *Everard's Stereometry*, p. 193.

Pounds of the latter were found equal to 18 Pounds 2 Ounces 15 Penyweights *Troy*; which fixes the Pound *Avoirdepois* at 7000 (1) ſuch Grains, as the *Troy* Pound weighs 5760; and upon three ſeveral Trials, made by the Gentlemen of the *Council* of the *Royal Society*, at the Exchequer, upon a Medium the *Avoirdepois* Pound was found equal to 7000,25 *Troy* Grains.

By the firſt (2) *Malt* Act, which paſſed ſoon after the making the Experiment upon the *Wincheſter* Buſhel, it is declared, that every Buſhel 18 Inches and $\frac{1}{2}$ wide, and 8 Inches deep, ſhould be eſteemed a legal *Wincheſter* Buſhel: And the *Coal* Buſhel is directed (3) to be made 19 Inches and $\frac{1}{2}$ Diameter, and to contain the laſt Buſhel and one Quart of Water. The firſt contains 2150,42 cubic Inches, the laſt 2217,47.

We now ſee different Meaſures eſtabliſhed by Law (4); and under the Exciſe Laws, two different Gages or Meaſures, uſed for taking the Dimenſions of *Wine* and *Ale* Veſſels. The *Wine* Gallon contains 231 cubic Inches, and the *Ale* Gallon 282; but upon what Foundation this laſt Meaſure was eſtabliſhed is difficult to determine.

Troy

---

(1) *Ward*, in his *Young Math. Guide*, ſays, 6999$\frac{1}{2}$ Grains. *Phil. Tranſ.* N°. 465. *p.* 181. and N°. 470. — Biſhop *Hooper* 10. *Pharmacopœia Londin.* ſays, — The *Avoirdepois* Pound is ſaid to be about 7000 Grains.

(2) 13 *W.* III. *c.* 5. § 28. and 1 *Ann. St.* 2. *c.* 3. § 10.

(3) 12 *Ann. St.* 2. *c.* 17. § 11.

(4) Though contrary to *Magna Charta*, and ſeveral other Laws not repealed.

Troy Weights had for ſome time been eſtabliſhed and uſed for the Money Affairs in the *Mint*, and for weighing Gold, Silver, and ſome few Commodities; and the *Avoirdepois* were in general Uſe for weighing all heavy and groſs Commodities. *Wine* Meaſure was generally look'd upon as equal to *Troy* Weight: From hence the Managers of the *Exciſe* Duty were perhaps led to fix the Standard of the *Ale* Gallon, bearing the ſame Proportion to the *Wine* Gallon as the *Avoirdepois* Pound did to the *Troy*; and according to this Conjecture, the two Gallons anſwer pretty exactly (1); the *Ale* Gallon exceeding the Proportion by ſomewhat more than one cubic Inch and one Quarter; but it exceeds the *Wincheſter* Gallon, or 268,2 cubic Inches by very near 14 cubic Inches: And not one of theſe Meaſures is agreeable to the Words of the *Aſſiſe*, which directs, (2) 'That the *Buſhel* ſhall contain 8 *Gallons* of Wheat, 'the *Gallon* 8 Pound of Wheat of *Troy Weight*, 'the *Pound* 12 Ounces of *Troy* Weight,' *&c.* according to the *old* Laws of this Land.

It is very plain the Law-makers in *Henry* the VIIth's Time took the *Troy* Weight for the Standard; and moſt Authors who have wrote upon this Subject have follow'd their Example.

The great Difficulty we are under in fixing upon a *Standard Pound*, agreeable to the *Aſſiſe*, ariſes from the Uncertainty of the Rule laid down in our Laws of

---

(1) For, as 144 : 175 :: 231 : 280, 729 — And as 144 : 175 :: 224 : 272, 222. This laſt comes very near the vulgar dry Gallon.

(2) 12 *H.* VII. *c.* 5.

of *Aſſiſe* for raiſing the *Pound* from 7680 Grains of *Wheat*; as theſe Grains differ in Weight, in different Countries, and in different Years, I might have ſaid in the ſame Field, and in the ſame Year.

The Uncertainty of a Pound ſo raiſed might with great Probability occaſion the Variety in our Weights and Meaſures, ſo often complained of in our *ancient* Laws, and for the Prevention whereof *Edward* III. in his 14th Year, ordered ‘ *Standard Weights* and ‘ *Meaſures* to be made of *Braſs*, and ſent into every ‘ City and Town in the Kingdom.’

The Laws of *Aſſiſe* never received any Alteration, except by the 12th of *Hen.* VII. when the Pound is declared to contain 12 Ounces of (1) *Troy* Weight, and the Gallon 8 Pounds of *Wheat* of *Troy* Weight; and ſince the Laws have received no Change, we have great Reaſon to conclude, that the Standard Weights themſelves never ſuffer'd any Addition or Diminution; but however this be, we (2) now find in the Cuſtody of the proper Officer of the *Exchequer*,

(1) This is the firſt time the Standard Weights are called *Troy* Weights. But in an Act 2 *H.* V. *St.* 2. *c.* 4. and 2 *H.* VI. *c.* 13. relating to *Goldſmiths*, there is mention made of *The Pound of Troy*.

(2) *Phil. Tranſ.* No. 470. —The *Avoirdepois* Weight of 14 Pounds is marked with a crowned E. and inſcribed

XIIII POVNDE AVERDEPOIZ.
ELIZABETH. REGINA.
1582.

The *Troy* Weights marked with a crowned E. are Ounces, from 256 down to the 16th Part of an Ounce: And there are no whole Pounds *Troy*, Peny Weights, or Grain Weights, at the Exchequer. There not being Pounds, or greater Weights, ſeems to be a Proof that theſe Weights were never deſigned or uſed for determining the Weight of large Bodies, or heavy Goods.

quer 2 Setts of Weights, kept there as Standards; one called *Troy*, the other *Avoirdepois* Weight.

As there is no Account handed down to us by our Anceſtors, ſhewing at what time, and upon what Occaſion, theſe Weights, differing conſiderably in Gravity from each other, were there firſt depoſited, we are at a Loſs to determine which is the *ancient Standard* Weight deſcribed by the Laws of *Aſſiſe*.

The Act in the 12th of *Hen.* VII. has called the Standard Weight by the Name of *Troy* Weight; this is the firſt time the Weights are ſo called in any of our *Aſſiſe* Laws; and notwithſtanding this Authority, it will be found very difficult, if not impoſſible, to reconcile the *Troy Weight* and *Meaſure* raiſed therefrom with the Words of the *Aſſiſe*, and any Meaſures now in being; for the natural and moſt ready Way to determine this Queſtion is to compare both the *Troy* and *Avoirdepois* Weight with Meaſures raiſed from each, according to the Rule laid down in the *Aſſiſe*, and with ſuch Meaſures as are or have been uſed by Authority.

'The moſt exact (1) and *geometrical* Way of expreſſing the Capacity of any Veſſel or Meaſure is 'by expreſſing in known Terms the Solidity of a 'Body which will preciſely fill it: The fitteſt will 'be Water. The Solidity of all Bodies is beſt expreſſed by the Help of a Cube, whoſe equal Sides 'we

(1) Biſhop *Cumberland*'s Eſſay, *p.* 60. — who alſo ſays, The *Egyptians* made their *Ardob* the Cube of their known Standard the *Cubit*: — And that the *Romans* made their *Quadrantal* the Cube of their Standard the *Foot*.

'we know by a Standard Meaſure of Length; and it 'appears, that this Way of determining Meaſures of 'Capacity is not only the moſt geometrical, but 'alſo exceeding ancient (2)'. By this Rule ſome Gentlemen at *Oxford*, in the Year 1685, determined the Weight of a *cubic* (3) *Foot* of *Spring Water*, or 1728 ſolid Inches, to be 1000 Ounces *Avoirdepois*; and by the ſame Rule the Capacity and Contents of the *Standard Buſhel* in the *Exchequer* was determined in the Year 1696, with great Care and Exactneſs: By the ſame Rule the Contents of other Veſſels of Capacity have been ſettled; and in the following Table *p.* 71. I have inſerted the Names of ſuch Meaſures as are of any Authority, whoſe Contents are known; by which the Proportion they bear to each other, and to Meaſures raiſed according to the *Aſſiſe*, as well from the Pound *Troy* as the Pound *Avoirdepois*, will be readily obſerved.

In the next place let us compare the Experiment made upon the *cubic Foot* of Spring Water with that upon the *Wincheſter Buſhel*, and we ſhall find an uniform and perfect Agreement between them; and that, upon each Trial, a cubic Veſſel, the Sides whereof were equal to an *Engliſh* Foot, did contain (4) 1000 Ounces *Avoirdepois* of Spring Water. From hence

---

(2) *Meaſures* of *Bodies* are either determined by their ſolid Contents, or Weight. Meaſures of Content are formed from Cubes of aſſigned Lengths. Biſhop *Hooper*, *p.* 2.

(3) *Phil. Tranſ.* No. 169.

(4) For as 1131. 14 *Troy* : 2145,6 :: 1000 *Avoir.* :: 1728,041. *oz. pwt. Cu. In. oz. Cu. In.*
Some Writers upon this Subject ſay, that a cubic Foot of Spring-Water

hence we are led to the Diſcovery of a *natural* and *univerſal Standard* for the *Engliſh Weights* and *Meaſures*; and ſuch an one as is, in every reſpect, agreeable to the Words of the *Aſſiſe* recorded in our moſt *ancient* Laws.

Magna Charta points out the *Quarter* of *London* as the only Standard for Meaſures and Weights of that time; but we are left to gueſs of what Meaſure or Weight it was the Quarter Part. If we ſuppoſe it the Quarter of a *Ton*, or 2000 Pound Weight, then the *Quarter* was 500 Pounds, and the eighth Part of that, or a *Buſhel*, was equal to a *cubic Foot*, or 62½ Pounds; from whence leſs Meaſures and Weights were eaſily deduced. Subſequent *Aſſiſe Laws* direct the greater Meaſures to be raiſed from the leſs; that 8 Pounds ſhould make a Gallon; 8 Gallons a Buſhel; which was to be the eighth Part of a Quarter; and by this Rule the *Quarter* is raiſed to 512 Pounds, and the *Ton* to 2048 Pounds. Theſe Meaſures and Weights are raiſed with Eaſe from known Parts of the *Foot*. For a cubic Veſſel, whoſe Sides are equal to $\frac{1}{10}$ of a Foot, will contain a Cube of Spring Water equal to an *Ounce Avoirdepois*; and from hence, by a regular *geometrical Progreſſion*, we ſhall obtain Cubes

---

Water is equal to 76 Pounds *Troy*; which is 10 Penyweights 20 Grains more than the 1000 *Avoirdepois*. *See* Arbuthnot's *Tables explain'd*, p. 80, 283. *Biſhop* Hooper's *State*, *&c.* p. 11. —— But the *Explainer* of *Arbuthnot*'s Tables ſeems to have been quite ignorant of any Experiment ſince Sir *Jonas Moore*'s Time; and to have diſregarded the due Proportion between the *Avoirdepois* and *Troy* Pound; and for 175. to 144. his Tables, he ſays, are calculated at 17. to 14.

Cubes equal to (1) 8 — 64 — 512 Ounces, or to 4 — 32 — 256 — 2048 Pounds *Avoirdepois*: And from a cubic Veſſel containing one ſuch Pound, we ſhall have other cubic Veſſels, equal in Weight 8 — 64 — 512 Pounds; and in Meaſure to the *Gallon, Buſhel* and *Quarter*, according to the *Aſſiſe*.

The (2) *Gallon, Buſhel*, and *Quarter*, are called dry Meaſures; and are uſed for aſcertaining the Quantity of Corn, and other dry Goods; the *Gallon* is alſo a liquid Meaſure raiſed from a *Pound*, in Liquids now called a *Pint* (3); from whence all the other liquid Meaſures are raiſed; but with this Difference in the Proportion, that the *liquid Buſhel* is not 64, but 63 Pounds or Pints; eight whereof make the *Hogſhead* equal to 63 Gallons; from whence the Contents, as well of the larger as ſmaller Veſſels or Meaſures of Capacity are ſettled.

The *Meaſures* of *Capacity* thus raiſed, are ſufficiently convenient for common Uſe, and are generally retained at this time; but for *Weights*, there has been ſome Variety from time to time, in the Compoſition of the larger ſort, uſed for determining the Weight of Merchandize and heavy Goods, as will appear from the following Extract from ſeveral old Acts

(1) Eight Ounces are equal to a *Mark*, whereof two, or twice the Contents of that Cube make a Pound *Avoirdepois*.

(2) The Half-Buſhel, Peck, Gallon, Pottle, and Quart, are directed by 25 *Ed.* III. *St.* 5. *c.* 10. to be made according to the King's Standard.

(*a*) See Biſhop *Hooper*, *p.* 6.

(3) See *Note* (5) of *p.* 66. *infra*. — The *Pint* is not mention'd in the *Aſſiſe* Laws; but Biſhop *Hooper* has given a long and *learned* Diſſertation upon that Meaſure, and calls it the *Pint* of *Old*, *p.* 458.

Acts of Parliament.—The *Stone* for weighing *Lead* was (1) ſettled at 12 *Pounds*; for Wax, Sugar, Spices, and Allom, at 8 *Pounds*; of which laſt, 13½, or 108 Pounds, made the *hundred Weight*: The *Sack* of *Wool* (2) was to weigh but 26 *Stone*, 14 *Pounds* to each *Stone*: A *Weye* (3) of Cheeſe 32 *Cloves*, each *Clove* 7 *Pounds*. And for many Years paſt, the *Hundred-weight* has been fixed (4) at 112 *Pounds Avoirdepois*, and that by a general Conſent, and without any particular Law to eſtabliſh it.

Theſe Weights have been univerſally and immemorially (5) uſed in *England*, with an Exception to the weighing of Gold, Silver, and ſome very few Commodities, for which the *Troy* Weight has been uſed for a great many Years. When it was firſt introduced

---

(1) *Cay's Abridgment Title Weights*, § 9.

(2) 25 *Ed.* III. *St.* 5. *c.* 9. 13 *R.* II. *c.* 9.

(3) 9 *H.* VI. *c.* 8. The Weye equalled 224 Pounds.

(4) That is, 14 *Stone* at 8 Pounds, or 8 *Stone* at 14 Pounds each, according to the *Old* Laws, and *preſent* Uſage of the *Stone* Weight. The 112 Pound is a very convenient Weight for a Standard, becauſe it is diviſible into more even Parts than any leſs Number. — And it is compounded from the *Aſſiſe Buſhel*, its Half and Quarter; that is to ſay, 64.32, and 16 Pounds.

(5) The *Apothecaries* (who, next to the Goldſmiths, are ſuppoſed to make the moſt Uſe of *Troy* Weights) ſeldom keep Weights adjuſted to the *Troy* Pound heavier than two Drams; but for all above buy and ſell by *Avoirdepois*: And with them, by the Term *Libra* in Meaſure is meant the *Wine Pint*; tho' this Meaſure is not, ſay they, ſo denominated from its containing an exact Pound-Weight of any Liquor, and the Term *Uncia* in Meaſure does not denote a twelfth Part of the Pint, but the ſixteenth; though in Weight, agreeable to its Signification, it is uſed to expreſs one twelfth Part of a Pound; ſo that an Ounce in Meaſure is ſcarce more than three Quarters of an Ounce in Weight. See *Pemberton's Diſpenſary* p. 44.

introduced into this Kingdom, does no-where appear; but Mr. *Folkes*, in his Tables of the *Engliſh Silver Coins* (1), tells us, it was not eſtabliſhed or uſed at the *Mint* before the 18th of *Hen.* VIII.

By reducing the *liquid Buſhel*, or one Eighth of the *Hogſhead*, from 64 to 63 Pints, it ſeems plain that our Anceſtors took the *cubic Foot* for their *Model*; the Contents of ſuch a Veſſel being $62\frac{1}{2}$ Pints or Pounds: And from hence, and from what has been ſhewn before, it is not very unnatural to conclude, that at firſt our Anceſtors fixed and eſtabliſhed as well their Weights as Meaſures from known Parts of this Model; taking always a whole Number for each *primary Weight* or *Veſſel*; and from thence proceeding, by a regular *geometrical* Proportion, to raiſe the greater Weights or Meaſures: So that the *Engliſh* Foot (the undoubted and univerſal *Standard* of all *Meaſures* of *Length* within this Realm) is alſo the Standard for the *Avoirdepois* (2) Weights, and all Meaſures of Capacity.

Upon

---

(1) *Page* 4. Mr. *Folkes* ſays, The Pound uſed at the *Mint* before that time, called the *Tower* or the *Moneyers* Pound, was equal to 5400 *Troy* Grains: And, *p.* 13, 14, that the Weight of the Groat, from 13 *Hen.* IV. to 4 *Edw.* IV. was equal to 60 ſuch Grains. Which is agreeable to what is ſaid in an Act of Parliament of 2 *Hen.* VI. that the Pound *Troy* of coined Money was worth 32 Shillings; for 32 Shillings, or 96 Groats, at 60 Grains each, weigh 5760 Grains, or a Pound *Troy*. Tho', by the ſame Act, by reaſon of the Scarcity of Silver Money, and in order to bring Bullion into the Mint, it was enacted, That Silver uncoined, of the ſame Goodneſs as the Money, ſhould be ſold only for 30 Shillings the Pound *Troy*.

(2) The very Name *Avoirdepois*, by which our common Weights are known, has by ſome been looked upon as a Proof that they

Upon the whole therefore, I think it is ſufficiently proved, that a *cubic Veſſel*, whoſe Sides are equal to an *Engliſh Foot*, will contain 1000 Ounces *Avoirdepois*, or very near that Weight of Spring-Water: That Weights and Meaſures, deduced by a regular *geometrical Progreſſion* from ſuch a Veſſel, or from cubic Veſſels, whoſe Sides are equal to known Parts of an *Engliſh* Foot, bear an exact Analogy to each other, and to Weights and Meaſures raiſed from a *Pound*, according to the Words of our moſt ancient *Aſſiſe Laws*. This being conſidered, and that the *Avoirdepois* Weight is now in common Uſe for determining the Gravity of all heavy Bodies, that this Weight

---

were of foreign Extraction. The firſt time I find the Word uſed in our Laws, is in an Act of *Ed.* III. *St.* 1. where it is applied to *Wines* as well as *Corn*; as it is afterwards in 25 *Ed.* III. *St.* 3. *c.* 2. and 16 *R.* II. *c.* 1. And in an Act 27 *Ed.* III. *St.* 2. *c.* 10. there is the following Clauſe:—'Becauſe we have perceived ſome Merchants buy *Avoirdepois* Merchandizes by one Weight, and ſell by another, we will and eſtabliſh, that *one Weight*, *one Meaſure*, and *one Yard*, be through all the Land; and that *Wools*, and all manner of *Avoirdepois*, be weighed by even *Balance*." This King, in his 14th Year, had directed *Standard Weights* to be made of *Braſs*, and ſent into every *City* and *Town*; and I conjecture, that thoſe *Standards*, from the Words of the foregoing Clauſe, took the Name of *Avoirdepois*, and were the Weights by which the Merchants uſed to *buy*. What were the lighter Weights by which they *ſold*, does not appear; perhaps the Pound *Troy*. That the former were the *lawful* Weights, appears by an Act 24 *H.* VIII. *c.* 3. where they are ſo called; and Butchers, who before that time ſold their Meat by Hand, were thereby obliged to provide themſelves with Beams, Scales, and Weights *ſealed*, called *Haberdepois* (for *Avoirdepois*); and in the next *Reign* the *Avoirdepois* Weights, now remaining as *Standards* in the *Exchequer*, were depoſited there, as appears from the Name and Inſcription thereon.

Weight now is, and immemorially has been, uſed for ſettling the ancient Duty of *Tonnage* and *Poundage* upon all Goods and Merchandize taken by Weight (except ſome few Drugs, which are charged in the Book of Rates by the Ounce *Troy*); and that there is not the leaſt Proof, either in our *ancient* or *modern Laws*, to induce a Belief that this Duty was ever generally taken by the *Troy* Weight, or that *Troy* Weights were ever in general and common Uſe in this Kingdom, it muſt ſurely be allowed, that the Weight mentioned in our *old Laws*, or Acts of Parliament, was the *Avoirdepois* Weight.

Poſtſcript.

The learned Biſhop *Cumberland*, in his (1) Treatiſe, ſays, 'That our *Engliſh Avoirdepois* Ounce is the 'ſame as the *Roman* Ounce; and was probably in-'troduced into this Kingdom by the *Romans*, when 'they gave Laws and planted Colonies here, and 'hath thence continued unchanged to this Day; 'which is not commonly obſerved, becauſe we uſe 'the *Avoirdepois* Weights only about heavier Com-'modities; not in weighing Silver and Gold, which 'are weighed by the *Troy* Ounce; which I ſuppoſe 'was introduced by the *Normans*, becauſe it takes 'its Name (2) from a *French* Town, *Troyes* in '*Champaigne*.' Moſt Authors (3) have been of this Opinion.

(1) See *p.* 11, 103, 107.

(2) Biſhop *Hooper*, *p.* 432, of another Opinion as to the Derivation of the Name.

(3) See *Hooper's Inquiry*, p. 10, 14, 92. and *Arbuthnot's Tables explain'd*, p. 16, and 283.

Opinion. This leads me to compare our *Engliſh* Foot with the *Roman* Foot, which Mr. *Greaves* takes as equal to 967 ſuch Parts, as ours is 1000. The *Roman Amphora* or *Quadrantal* is generally allowed (1) to be equal to a *cubic Roman Foot*; and to contain 80 Pounds, or 960 Ounces. Then the Side of the *Amphora* is equal to (2) ,986 Parts of the *Engliſh Foot*; agreeing exactly with the Foot deduced by *Villalpandus* from the *Congius* of *Veſpaſian*; and a cubic Veſſel, whoſe Sides are equal to ,967 Parts of the *Engliſh* Foot, will not contain (3) quite 904$\frac{1}{4}$ Ounces; which, if true, reduces the *Roman* Ounce to near 412$\frac{1}{12}$ Grains *Troy*.

---

(1) See Biſhop *Hooper*, *p.* 152, 175. *Greaves's Miſ. Works*, *p.* 198, 199, 297, 303.

(2) For the cube Root of 960 is 986,1. And
oz. *Parts.*

(3) The Cube of 967 is but 904,231063. And Mr. *Greaves* himſelf ſays, an *Amphora* made by the *Pes Colotianus* held only 7$\frac{1}{2}$ *Congii*, equal to 900 *Roman* Ounces; which comes as near the Cube of 967, as can be expected from the uncertain Method he took to determine the Contents of that *Amphora*, which was by filling it with 7 *Congii*, and, as he gueſſed, about an half, of *Milium*. See his *Miſcellaneous Works*, (1737) *p.* 225.

The

The Table of	Buſhels in Cube Inch.	Gallons in Cu. Inch.	Pints in Cu. Inch.	Weight of the Gallon in *Avoirdep.* Pounds.
By the Coal Act	2217,47	277,183	34,648	10,025
By the Malt Act	2150,42	268,8	33,6	9,722
Wincheſter Buſhel	2145,6	268,2	33,525	9,6
From, the Wine Gallon	1848	231	28,875	8,354
The *Guildhall* Gallon	1792	224	28	8,101
16 Oz. *Avoirdepois*	1769,472	221,184	27,648	8
12 Oz. *Troy*	1456,0224	182,0028	22,75035	6,5826
The following are not ſupported by any Law or Authority:				
(1) The vulgar dry Meaſ.	2178 †	272,25	34,0625	9,8468
(2) The Ale Meaſure	2256	282	35,25	10,1995

(1) Dr. *Arbuthnot* gives a *Table* of the *vulgar dry Meaſure*, as the Contents of the *Wincheſter* Meaſure. And he had ſo little Regard for the *Averdepois* Weight, that he does not give any *Table* thereof.

(2) The *Ale* Meaſure even exceeds the *Coal* Meaſure. And the Exceſs of the *Ale* Meaſure above the *Wincheſter* is more than one in 20 of the laſt Meaſure.

(†) See the Note (1) *p.* 60.

XVI.

XVI. *A Letter from Dr.* le Cat *F. R. S. to* C. Mortimer *M. D. Secret. R. S. concerning the Cure of* Dry Gangrenes: *together with a Deſcription of a new-invented Inſtrument for the* Extirpation *of* Tumours *out of the Reach of the Surgeon's Fingers.*

Tranſlated from the French *by* Ph. H. Zollman *Eſq*; *F. R. S.*

SIR,

Read March 9 *and* 16. 1748-9. FOR ſome Years paſt, in curing the dry Gangrene, I have made ſome Progreſs, of which I think I ought to inform the *Royal Society*.

From the Year 1725 to the Year 1733, when I frequented the Hoſpitals of *Paris*, I ſaw that a great many Perſons there died of a dry Gangrene, and even that nothing was done to them. I knew that Amputation had been attempted in vain; but I did not ſee any of the Practitioners endeavour to cure that Diſtemper by Remedies; nor did I think that Cure impoſſible. I ſuſpected, that the Cauſe of the dry Gangrene was the want of a Flow of the arterial Blood and of the Spirits into the Part affected: And this Want, as it accounts for the Deadneſs, which cannot miſs befalling the Part, and the Dryneſs which attends this ſort of Mortification; whereas in the humid Gangrene, it is chiefly the Return of the Blood which is hindered, and thereby the Fluids are accumulated, that ſwell and diſtend the Part.

Two Cauſes ſo oppoſite muſt demand alſo very different Cures. The Diſtenſion which characterizes the humid Gangrene ſhews the Neceſſity there is for Scarifications

Scarifications and Evacuations; as the Dryneſs of the other Gangrene points out the Uſeleſsneſs of theſe Operations in this ſort.

In the humid Gangrene the Solids are choaked up, and overflowed with the accumulated Liquid; the Nerves are there ſtupefied and benumbed: What can be more proper then after Scarifications, which diſgorge and relax thoſe Regions, than to apply ſtimulating *Topics*? *Tonics*, which reſtore the Spring, the Tone of the ſolid Parts; help them to expel thoſe ſuperfluous Liquors, the Spirits of which are as it were drowned and ſuffocated; and in ſhort the Defect being local, if thoſe Succours do not ſuffice, it is very common to cut off a Limb; the Loſs of which may bring on that of the whole Perſon.

On the contrary, in the dry Gangrene the Solids are void of Fluids of all ſorts. The neighbouring Regions, which begin to ſhare of that Want, are affected with the moſt cruel Pains: If you attack thoſe Parts with the cutting Inſtrument, you increaſe the Irritation of the Solids, the Conſtriction of the Veſſels, the Want of Fluids, the Exſiccation, and haſten Death.

On the contrary, the general Indication, which this Diſtemper affords us is therefore to ſoften, to relax the Veſſels, to draw thither the Liquors by Topics, whilſt inwardly all Remedies muſt be given that are capable of bringing the Blood and the Spirits from the Center to the Circumference.

If this Method is not ſucceſsful, Death is inevitable; for even ſuppoſing that the Amputation was not liable to the diſmal Conſequences juſt now ſpecified, there is no Room for this Operation in an internal Defect, which depends on the whole

Habit, as the Caſe is with the dry Gangrene. And ſuppoſing that there are dry Gangrenes purely local, as the critical *Depoſitums* of certain malignant Fevers, you may aſſure yourſelf, that the very ſame Nature which has cauſed this Criſis, if you aſſiſt her but a little, will be able alſo to ſeparate this Mortification from the ſound Parts; and ſhe will do it more gently and more dextrouſly than we.

Theſe were the Notions I had formed to myſelf of theſe two ſorts of Gangrenes; I only waited for Opportunities to make the Trials which this Theory ſuggeſted to me.

I did not find any before 1738. in the Perſon of a Wood-Merchant of our Town, called Mrs. *Fournaiſe*. She was then 65 Years of Age, extremely corpulent; the Gangrene ſeized her at the Heel, by a black and round Blotch, of two Inches Diameter, without any Tumour, with ſome ſmall ſcorbutic Spots, great Pains, and a little Fever.

The *Plethora* made me begin with Bleeding and Purging; the latter I repeated every 8 Days.

I applied all over the Foot and Part of the Leg, a Pultis made of Herbs and *Farina's*, emollient, reſolving, and aromatic, the ſuppurative Ointment, and *Storax*.

I gave inwardly diaphoretic Ptiſans: In the Morning, Broths of Vipers, of Crayfiſh prepared with proper Herbs, and above all with Water-creſſes: In the Evening a Bolus of *Theriaca*. In ſhort, I followed intirely the Theory I had formed to myſelf about the dry Gangrene, and in 9 or 10 Days I ſaw the Suppuration formed; ſo that my Patient was perfectly cured in about 2 or 3 Months.

This

This Succeſs has been followed by many others, both in our Town and in our Hoſpital. I have been particularly ſucceſsful in the latter Place, becauſe I am more Maſter there than any-where elſe, to ſee my Method exactly followed, which I have ſtill improved ſince 1738.

The Report of theſe Cures having ſpread itſelf as far as *Paris*, I was ſent for thither in *February* 1746. to attend M. *Rondé*, Treaſurer-General of the Fortifications of *France*, who was at the laſt Extremity, by a dry Gangrene, which had ſphacelated his Foot; the Cauſe of which had kept him in a languiſhing Way for 4 Years. M. *Rondé* was in a dreadful Condition, and I was vexed at having been ſent for in ſo deſperate a Caſe: I declared it to his Relations, and to the eminent Surgeons who attended him: I therefore applied my Remedies to the Patient, at the Requeſt of his Relations, only by way of Trial, which I publicly declared to be moſt doubtful. However, contrary to our Expectation, from the 3d Day there appeared plainly a Beginning of Suppuration, and a Separation of the Eſchars. On the 9th Day there was a complete Suppuration, and the Regeneration of the Fleſh was even ſo far advanced, that the Singularity of it raiſed the Curioſity of ſome of the firſt Surgeons of *Paris*. At laſt, on the 15th Day my Patient found himſelf in a more favourable Criſis; which, according to the Teſtimony which M. *Morand*, an aſſiduous Spectator of my Cure, publicly gave of it, *gave Hopes of Recovery in a Caſe that had hitherto been thought deſperate*.

The Suppuration, the Separation of the Eſchars, and the Regeneration of the Fleſh, being all that a Surgeon can deſire in a like Cure, I then thought that my Miſſion was fulfilled, and that I might return home, whither I was called by more material Affairs. I had Reaſon to repent of this Journey: My Patient having naturally a very voracious Appetite, I had confined him to a ſevere Diet; but he could hold out no longer; and, by the Connivance of his Nurſe, he took various Food, and that plentifully too. This Conduct had ſoon ruined our Progreſs. I returned to *Paris*; my Repreſentations were uſeleſs: The Patient had ſhaken off the Yoke of the Faculty, and of Reaſon. Indigeſtions enſued one upon another. The Looſeneſs, which never left him after, totally ſuppreſſed the Suppuration, and made him void the Matter quite crude by Stool, and at laſt he died.

I was ſcarcely returned to *Rouen*, when there came to my Hoſpital a Patient ſeized with the dry Gangrene, and who ſo perfectly reſembled M. *Rondé*, that we commonly called him *the Rondé of Rouen*.

This Cure being extremely intereſting in all its Circumſtances, I think, Sir, it is fit to tranſcribe for you the Obſervation taken from a Letter which I wrote on the 28th of *November* 1746. to M. *Morand*, and which he has ſince made public.

" As this Letter has been made public by Mr. *Morand*,
" I ſhall not fill up this *Tranſaction* with a Tranſ-
" lation of a long Letter already in Print, but
" only give a ſhort Account of the Caſe.

C. M."

Thomas

Thomas le Monnier, a Carpenter, aged 66, was, in *December* 1744. ſeized with violent Pains in his right Foot reſembling thoſe of the Gout, but without ſwelling, and not preceded by any Sickneſs. He had work'd hard at his Trade, and ſtill carried it on in marſhy Places, and in bad and cold Weather, when he was ſeized with this Pain. He took various Remedies to no Effect. In *November* 1745. his great Toe turned black; which Blackneſs gradually ſpread to the other Toes, to the whole Foot, and at laſt to the Ankle. He was ſent to the *Hotel Dieu* at *Roan May* 19. His Foot was intirely gangrened, black and dry; his Pulſe was low, and a little feveriſh; he never ſlept but 2 Hours a Night, ſuffered cruel Torments, was greatly emaciated, and of a yellow and leadiſh Complexion; his other Foot was œdematous. 'M. *le Cat* ſays, he would not attack 'this Caſe Steel in Hand, by Scarifications or Am-'putation; cruel and murthering Methods! which 'quite extinguiſh the Springs of Life in the nervous 'Syſtem, which is already but too much ruffled. 'A barbarous Surgery! which Prejudice, Ignorance, 'and Unskilfulneſs alone can adopt, and by which I 'have ſeen Patients die, when there were great Hopes 'of their Recovery.' See *le Dran*'s Operations, *p.* 30. *Saviard*'s Obſervations, *p.* 98. and *de la Motte* Obſ. 303. eſpecially *p.* 371. *Tome* III.

As this Diſorder ariſes from internal Cauſes, its Cure is chiefly to be attempted by internal Remedies; and of theſe I give Cordials, Diaphoretics, and ſuch as are capable of reviving the drooping Spirits, and of quickening the Circulation even to the Extremities:

To

To which ſhould be joined Medicines adapted to the particular Habit of each Patient, whether it be ſcorbutic, ſcrophulous, or any other, which may have contributed to have brought on this particular Species of Gangrene: At the ſame time emollient, attractive, external Remedies, moderately warmed with Spices, applied to the Part, concur to the ſame Intention, by facilitating the Flow of Blood and Spirits; the Interception of which makes the diſtinguiſhing Characteriſtic of the dry Gangrene. Spirituous and aqueous Topics, impregnated with Volatiles, charged with ſaline, active, violently ſtimulating Particles, and others in Uſe in ordinary Gangrenes, are to be avoided like deadly Poiſons; for ſuch Applications would rather contract and dry up the Part the more, and increaſe the painful Irritations, and diſpoſe the contiguous Parts to a dry Gangrene. He gives us Hopes of a Treatiſe expreſly on this Subject.

But to return to the Caſe. The Suppuration began to appear, and the *Eſchars* diſtinguiſhed themſelves from the live Fleſh the very firſt Days of the Cure; and, after the Time uſual in the like Suppurations, the Foot and lower Part of the Ankle ſeparated of themſelves; and afterwards, healing over intirely, left a Stump quite cover'd over with a Covering of Fleſh, except ſome Points of Bone, which were not eaſily to be ſeen, but might be felt, by paſſing the Finger over this new Fleſh.

After this Separation the Tendons of the Muſcles, which lie along the Leg, formed Abſceſſes and *Sinus's*. Some Practitioners would have laid open theſe *Sinus's* their whole Length; but ſuch large Inciſions

Inciſions would have ſo affected the Syſtem of the Nerves, as to have brought back the gangrenous Diſpoſition into the internal Parts, and ſo have deſtroy'd the Patient; as M. *le Cat* ſays he has ſeen it very lately happen by the like Practice: Wherefore he lets the Matter gather in thoſe *Sinus's*, till it forms a Bag, and greatly thins the Skin, when he opens them almoſt without Pain, in the Place only where they point. Theſe Openings are ſufficient both for the Diſcharge of the Matter, and for the coming away of the Tendons; which no ſooner happens, but the Integuments, whether open'd or not, unite and cicatrize. Thus, at the End of 6 or 7 Months, the Stump itſelf cicatrized, and the Patient was quite recover'd.

So long a Cure could not but be liable to ſome Accidents: The Patient was one who would indulge in his Diet, and the Hoſpital is open for any one to come in and viſit their Friends: He had ſeveral ſtrong Acceſſes of an accidental Fever, and five or ſix violent Indigeſtions; one in *July* kept him inſenſible for 20 Hours, and was attended with a Defluxion on the Lungs, accompanied with ſuch Expectorations as gave the worſt Prognoſtications. Theſe were Incidents which render'd his Recovery the more remarkable. He has pick'd up his Fleſh, and promiſes to enjoy a good Habit of Body; ſo that probably he may live to a good old Age. Several that have been cured by the Doctor of this Diſorder have lived to upwards of 70.

Thus, ſays he, the common Opinion, that it is impoſſible radically to cure the dry Gangrene, is as falſe, as the ordinary Method of treating it is bad.

He

He does not eſtabliſh his Method as infallible; but aſſures us, that, in 8 or 9 Years Practice it has not failed curing any Perſons who exactly followed it, and obſerved the Regimen preſcribed.

"We now return to Dr. *le Cat*'s own Words."

I ſhall here ſubjoin the Deſcription of an Inſtrument of Surgery, which I have lately invented.

Forceps *for the Extirpation of Tumours too remote from the Surgeon's Fingers.*

When the Fingers can lay hold of an Excreſcency, the Surgeon need not think of making uſe of Machines for it; he will never find any convenient enough; but all Tumours that are to be extirpated are not within the Reach of the Fingers: There are even many of them which the Fingers can reach, but where they cannot lay hold of them, nor work as the Extirpation requires. Such are the Excreſcences ſituated a little deep in the *Anus*, in the *Vagina*, in the Throat, *&c.* For the like Extirpations I have been obliged to invent the *Forceps* which I am going to deſcribe.

Fig. 1. The firſt Figure repreſents the *Forceps* ſhut, as they are when the Inſtrument is cloſed, or when it holds a ſmall Excreſcency.

AC is the Extremity deſigned for laying hold of the Excreſcency: It is of Silver, pliant as far as *aa*, in order to be able to give to theſe Cheeks the different Figures which thoſe of the Tumours to be extirpated may require. The Inſide of theſe Branches

is lined with a Slip of Buff-Skin, or close Shamoys (*KK, Fig.* 2. TAB. III.) to prevent the Tumour's slipping when once it has been laid hold of.

BD is the Extremity of the *Forceps*, to be held in the Hand of the Operator.

EF, GH, are the Pieces which connect the two Parts of the Instrument, instead of the common Joints or Rivets of the other *Forceps*, in a very advantageous manner. These Pieces make the principal Utility of this Invention.

Fig. 2. TAB. III. represents the Pincers taken to pieces in two Parts.

One easily sees that the Piece *E* is to go into the Notch *gg*, so that the Screw *f* may pass through its Slit, and that the Nut *F*, put on upon that Screw *f*, is to keep the Whole together: But one thing which the Figure cannot shew, is, that this Piece *E* is moveable in the Direction lengthways of the *Forceps*, to answer the different Openings of the Cheeks. You may observe in *b* the Pin upon which this Piece turns.

The Piece *G* likewise receives the Screw *h* into its Slit; and the one and the other is stopped by the Nut *H*. But an essential Remark with regard to the Piece *G*, is, that it must have the Figure of an Arch of a Circle, the *Radius* whereof is the Instrument itself; that is to say, it ought to be the Portion of an Arch of a Circle, the Center of which is at the Extremity of the Instrument; and this to the end that in the small Extremity of the Pincers, the Ends of the Cheeks find themselves over-against each other, whatever Opening one may give to the larger Extremity, or to the Handle *GH*.

To explain the Uſe of theſe *Forceps*:

I ſuppoſe I am to extirpate an Excreſcence, a *Condyloma*, of two Inches Depth in the *Rectum*. I cannot lay hold of this Tumour with the Fingers, nor make it come out; yet it is very troubleſome to the Patient, and one is diſpoſed to ſlit or lay open the *Anus*, to make room for this Extirpation. With our *Forceps* we ſhall avoid this cruel Preparative, and ſhall with great Eaſe make the Extirpation.

Firſt, I introduce the Fore-finger of the left Hand into the *Rectum* over the Tumour that is to be extirpated, to make myſelf ſure of the Situation: With the right Hand I take the Part of my *Forceps CD*, *Fig.* 2. and thruſt it into the *Rectum*, under the Finger which is already there, and make it ſlide along the right Side of the Tumour, which to me is the left Side.

With the Fingers of the left Hand I ſupport this Inſtrument in its Situation, whilſt with the right Hand I introduce the other Part of the *Forceps AB*, *Fig.* 2. and let it ſlide along the left Side of the Tumour, which is over-againſt my right Hand.

Without taking the Fore-finger of my left Hand out of the *Rectum*, I put together the Parts of the Inſtrument. I preſs between its Cheeks the Tumour by its Root; after which I draw the Fore-finger out of the *Rectum*. I take with the left Hand the Handle of the *Forceps BD*, *Fig.* 1.; I thruſt along the right Side of their Cheeks underneath the Knife *Fig.* 3. the Button *A* being turned againſt the Cheeks, and the Back *CD* towards the Inſide of the *Rectum*.

I puſh this Inſtrument as far as beyond the Tumour under the Extremity of the Cheeks of the *Forceps*, of

of which I can make myſelf ſure with the Fore-finger of the left Hand. —— Then I raiſe towards the upper Part the Cheeks of the *Forceps*, in order to prolong as much as poſſible the Root of the Excreſcence; and in this Condition I pull towards myſelf, with the right Hand, the Knife; which does not fail cutting the Tumour.

There are Caſes, in which the Inſtrument, *Fig.* 4. will be of more convenient Uſe. This cuts only by its Creſcent *ab*, puſh'd forward, and mov'd alternately from one Side to the other, to aſſiſt its Cutting.

There are Circumſtances, wherein the Knife *Fig.* 5. may be preferable.

In fine, there are others, wherein all theſe Inſtruments are of Service in one Operation, which happen'd to me in *October* 1748. in the Extirpation of a ſcirrhous *Polypus* in our *Hotel Dieu*; in which Operation I employ'd not only all the Inſtruments above deſcribed, but alſo a cutting *Forceps*, which I had contrived in 1735. for the Extirpation of *Fungus's* of the Bladder; and which alone was proper to take off one Part of this Tumour, that was as large as a Gooſe's Egg, and was falling into the Throat.

I ſuffer the Wound to bleed a little, and then dreſs it with all the Precautions uſually taken againſt Hæmorrhages in the Operation of the *Fiſtula* in the *Anus*.

Forceps *for extracting Stones, and other foreign Bodies, lodged in the Parts where the common* Forceps *are of no Uſe.* Fig. 6. Tab. III.

The ſame Mechaniſm juſt now deſcribed in the foregoing *Forceps*, may be applied with Advantage to the *Forceps* with which the Stone is pulled out, and to other Inſtruments deſigned for extracting Bullets, Splinters of Grenadoes, Pieces of Iron, and other foreign Bodies.

There are ſeveral Caſes in the cutting for the Stone, in which no Uſe can be made of the common *Forceps:* The moſt frequent is this; when a Stone, laid hold by the ordinary *Forceps*, eſcapes from the Inſtrument half-way, and ſo remains engaged in the Inciſion. The Expedient commonly taken, is to puſh the Stone back into the Bladder, in order to have again the neceſſary Room for managing the *Forceps*; But beſides the cruel Pain in thus puſhing back the Stone into the Bladder, this foreign Body may enter into the cellular Texture which ſurrounds the Bladder, and lodge itſelf there, and then the *Forceps* not having any longer that Play which was endeavoured to procure to them, the Stone will remain in that fatal Lodgement, without Poſſibility of pulling it out, and the Patient will die. This has been ſeen many times.

The Stone having ſtopp'd in the Paſſage of the Inciſion, you ſlide along the Body of it one of the Cheeks of our *Forceps*, *A* or *C*, well-oiled, which will be done without much Trouble, as I have experienced it; the other Cheek afterwards will

paſs on the other Side; after which you join them, as has been ſhewn above, taking care to preſs cloſe the Extremity *AC* upon the Stone, and to leave the largeſt Opening on the Side of the Handle *BD*, as in *Fig.* 7. both to hinder the Stone from eſcaping, and to widen its Paſſage; then, having well-ſecured the Screw *G*, you leave the Screw *F* almoſt at Liberty. You graſp the Inſtrument with both Hands, as near the Stone as you can, and you draw that Body out, managing it as is uſual with the common *Forceps*.

A ſecond Caſe of cutting for the Stone, where theſe new *Forceps* will be of great Uſe, is this; when the Stone is exactly embraced by the internal Coat of the Bladder; be it that it completely fills this whole Organ, or that it fills Part of it, which may have cloſed itſelf upon the Stone; as has happen'd to *Joſeph Bunel*, whom I cut at *Andelys* in 1743. of which I have communicated the Obſervation to the *Royal Society*; or that the Stone has made to itſelf a Lodgement or Bed in the inſide Coat of the Bladder, prolonging itſelf towards the cellular Texture, which ſurrounds a ſmall Part of thoſe inſide Coats; as I ſaw it in the Bladder of M. *Pigache*, an eminent Counſellor of our City of *Rouen*.

In ſhort, every foreign Body lodged in the Subſtance of any Part of the human Body, be it of what Nature it will, becomes the Object of our Inſtrument; and the Extraction of it will, in my Opinion, become much more eaſy by the means of theſe *Forceps*, than by the Bullet-drawers, and moſt of the other Inſtruments invented for that Purpoſe; provided however one gets *Forceps* made of all ſorts

of

of all ſorts of Lengths and Bigneſs, in ſhort, of all the Shapes which the different Caſes may require.

I have the Honour to be, *&c.*

Rouen, May 20.
1748. *N. S.*

——— Le Cat.

Addition to the Deſcription of the Glaſſes *for preſerving things in* Spirit *of* Wine, *by Dr.* le Cat, *pag.* 6.

In uſing the Bottle, of which I have given a Deſcription, I found that it was attended with one Inconvenience.

The circular Groove, the Edge of which was turn'd up on the Inſide of the Bottle, retained a ſmall Quantity of the Water, when I emptied and rinſed it; ſo that it was impoſſible to do it thoroughly.

Wherefore I cauſed this Veſſel to be made, as repreſented in the annexed Figure, TAB. I. *Fig.* 1. which is a Section of it; and where it appears that the Groove *AA* is placed on the Outſide of the Edge of the Bottle. By this means every Drop of the contain'd Fluid can be pour'd out.

It is eaſy to ſee that the circular Border *BB* of the Cover is to enter into theſe Grooves *AA*, which are fill'd with Oil or Quickſilver; and that the Hook *C*, of the ſame Cover, is deſtined to ſuſpend in the Liquor ſuch Pieces as are to be preſerved in it.

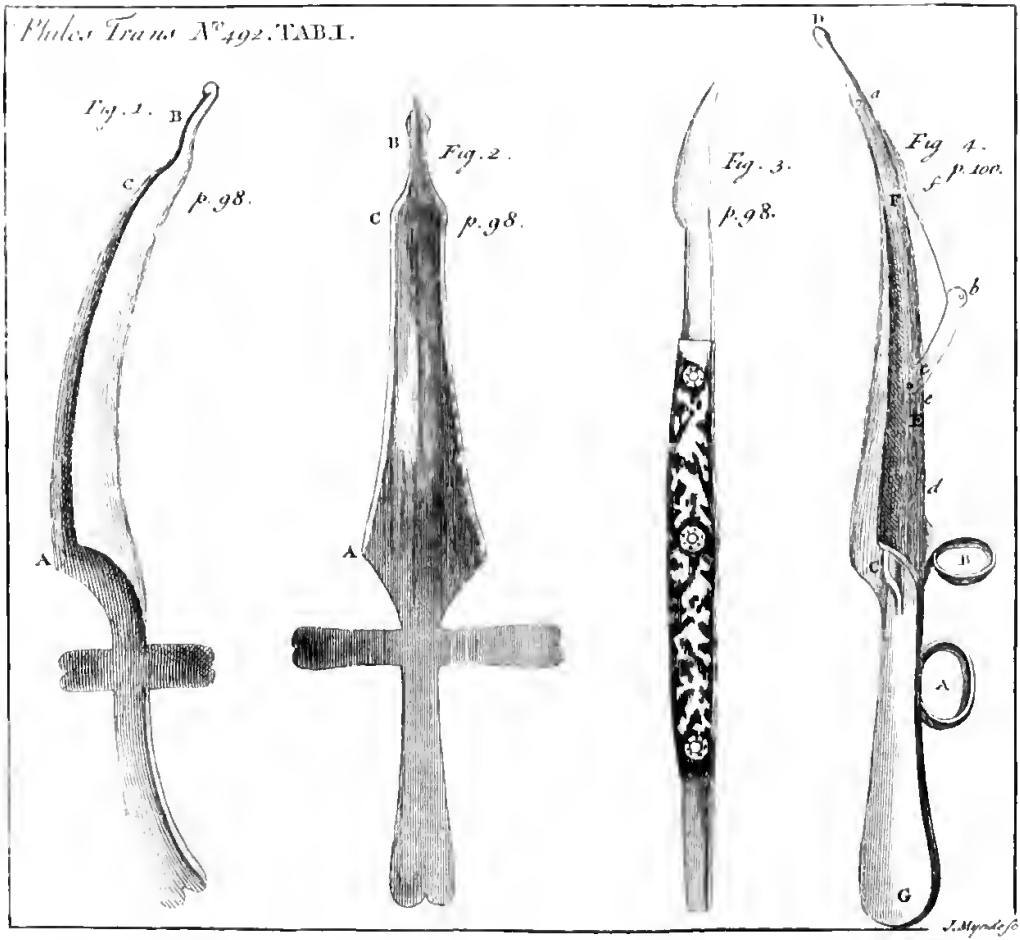

Philos Trans N° 492. TAB. I.
Fig. 1.
p. 98.
Fig. 2.
p. 98.
Fig. 3.
p. 98.
Fig 4.
p. 100.
J. Mynde sc

Fig 8 p. 122.

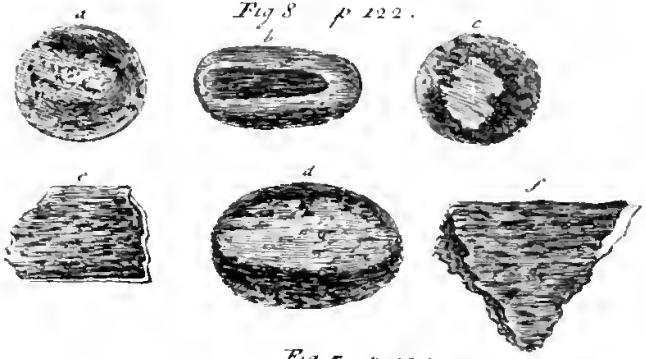


Fig. 4. p. 124.

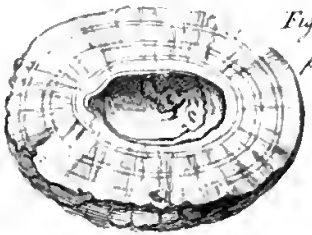


Fig. 2. p. 123.

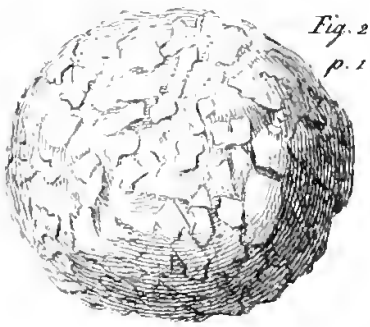


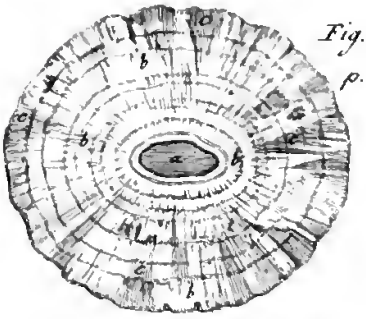
Fig 7. p. 125.

Fig. 5. p. 124

Fig 6. p 125

Fig. 1. p. 123.

Fig. 3. p. 123.



J. Mynde sc.

Philos Transact. N° 492 TAB. III.

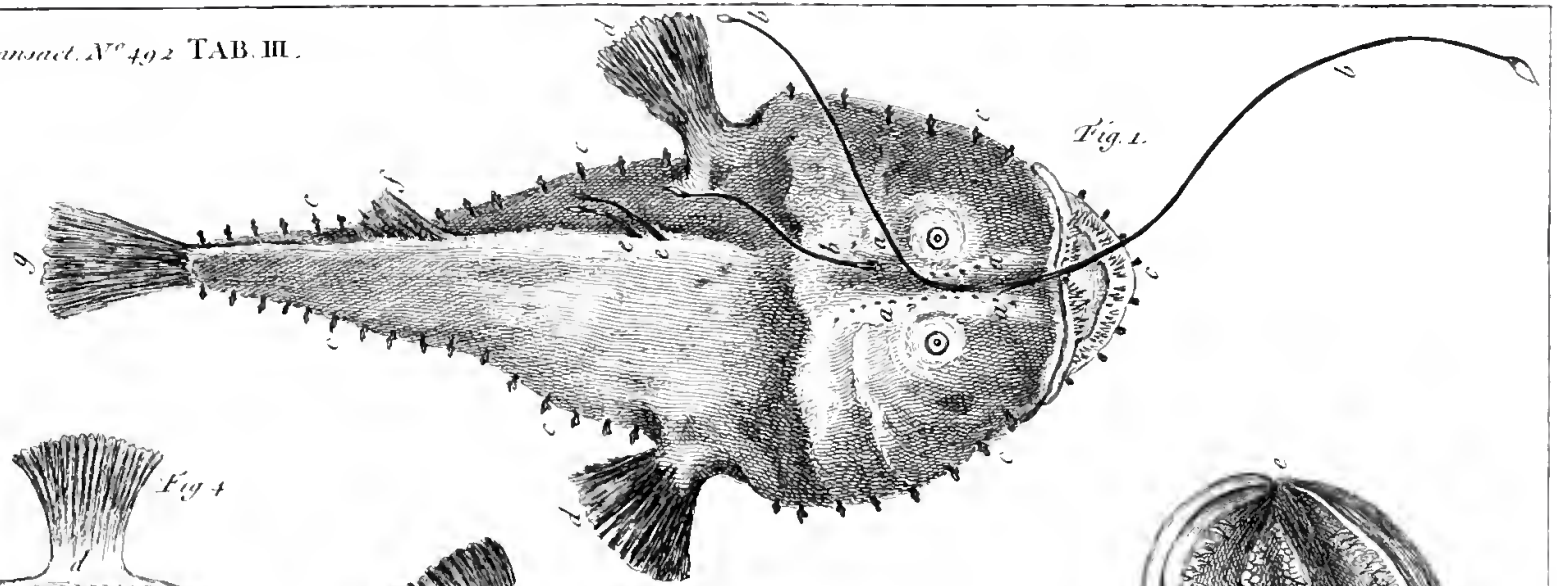


Fig. 1.

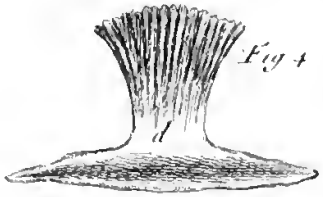


Fig 4

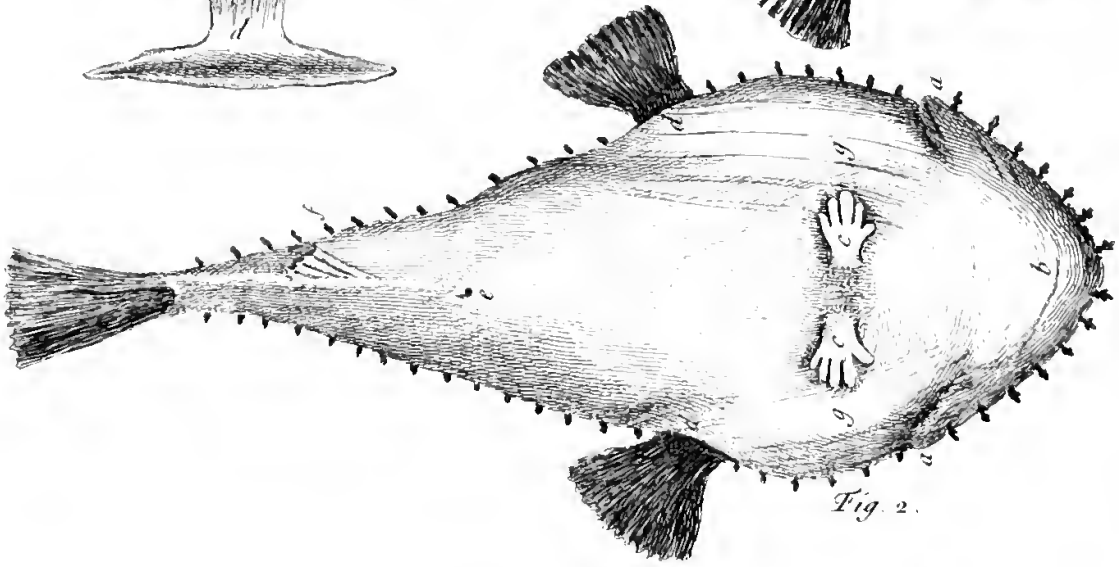
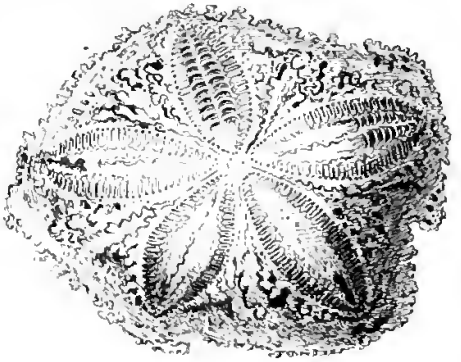


Fig. 2.

Fig. 3.

J. Mynde, fc.

Fig. 1.



p. 148.

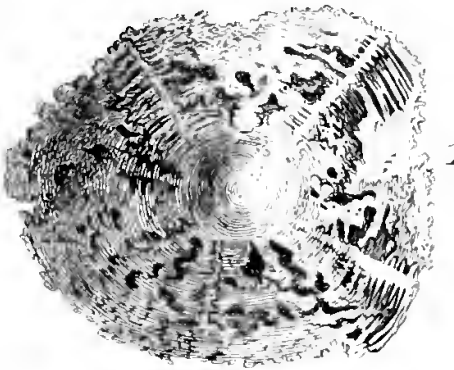


Fig. 2.

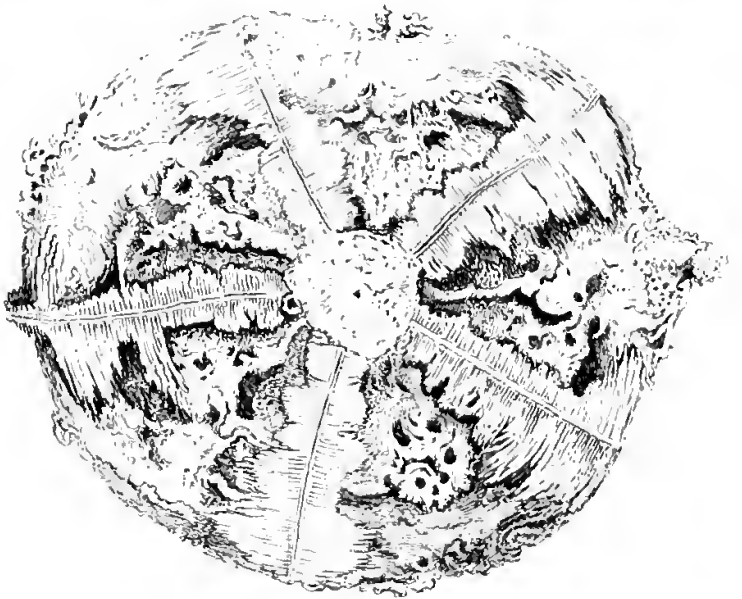


Fig. 3. p. 144.

J. Lynde sc.

Numb. 492.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April*, *May*, and *June*, 1749.

I. Viæ *Cometarum*, ſecundùm hypotheſin quæ ſtatuit illos curſu ſuo Parabolam circa Solem deſcribere, per *Nicolaum Struijk*, R. S. *Lond.* S. *p.* 89

II. Epiſtola à *Joh. Jacobo Hubero* M. D. Med. & Conſil. Reg. Suec. & Anatom. Prof. *Caſſel.* ad *Cromwell Mortimerum* R.S. Secret. de *Cadavere aperto*, in quo non exſtitit *Veſica fellea*; et de *Sterno gibboſo*. *p.* 92

III. *The Operation of* Lithotomy *on* Women, *by Monſ.* le Cat, *M. D. & F.R.S. Tranſlated from the* French, *by* T. S. *M. D. and F. R. S.* *p.* 97

IV. De *Barometrorum* cum *Aëris* et Tempeſtatum mutationibus conſenſu: Auctore *Sam. Chriſtiano Hollmanno*, Philoſ. in Acad. *Gottingenſi* Profeſſ. publ. ordin. et R. S. *Lond.* S. *p.* 101

V. *A Letter from Captain* John Waddell, *to Mr.* Naphthali Franks *Merchant, concerning the Effects of* Lightning *in deſtroying the* Polarity *of a* Mariners Compaſs; *to which are ſubjoined ſome* Remarks *thereon, by* Gowin Knight, *M.B. F.R.S. p.* 111

VI. *A Letter from Sir* Hans Sloane *Baronet, late Pr. R. S. to* Martin Folkes *Eſquire Pr. R. S. containing Accounts of the pretended* Serpent-ſtone *called* Pietra de Cobra de Cabelos, *and of the* Pietra de Mombazza *or the* Rhinoceros Bezoar, *together with the Figure of a* Rhinoceros *with a* double Horn, *from a Coin of* Domitian. *p.* 118

VII. *Some Account of the* Rana Piſcatrix; *by* James Parſons, *M.D. F. R. S. p.* 126

VIII. *Obſervations on the Height to which Rockets aſcend; by Mr.* Benjamin Robins *F. R. S. p.* 131

IX. *Extract of ſo much of Don* Antonio De Ullöa's *F. R. S. Account of his Voyage to* South America, *as relates to the Diſtemper called*

called there Vomito Prieto, *or black Vomit. Tranſlated from the* Spaniſh *by* W. Watſon *F. R. S.* *p.* 134

X. Declinationes quarundam *Stellarum Auſtralium* primæ et ſecundæ magnitudinis, menſe *Junio* 1738. cum methodo inveniendi horam in mari noctu, ex aſpectu *Crucis auſtralis*; per Dn. *de la Condamine*, Reg. Societ. *Londin. & Acad. Reg. Scient. Pariſ. Socium.* *p.* 139

XI. *A Letter from Mr.* Emanuel da Coſta *F. R. S. to the* Preſident, *concerning two beautiful* Echinites. *p.* 143

XII. *The State of the* Tides *in* Orkney; *by Mr.* Murdoch Mackenzie. *p.* 149

XIII. *Some Account of the Remains of* John Tradeſcant's *Garden at* Lambeth; *by Mr.* W. Watſon *F. R. S.* *p.* 160

XIV. *A Letter from the Rev. Mr.* Richard Dunthorne *to the Reverend Mr.* Richard Maſon *F. R. S. and Keeper of the* Woodwardian Muſeum *at* Cambridge, *concerning the* Acceleration *of the* Moon. *p.* 162

XV.

XV. Alberti Halleri, *Archiatri Reg. Medicin. Prof.* Gotting. & R. S. Lond. *S.* Fabricæ morboſæ in cadaveribus repertæ hiſtoriæ aliquæ. *p.* 172

XVI. *A Memoire on the* Lacrymæ Batavicæ, *or Glaſs-Drops, the* Tempering *of* Steel, *and* Efferveſcence, *accounted for by the ſame Principle. By* Claud. Nic. le Cat, *M. D. F. R. S.* &c. *Tranſlated from the* French, *by* T. S. *M. D.* *p.* 175

XVII. *Extract of a Letter from Mr, Prof.* Geo. Matthias Boſe, *of* Wittemberg, *to Mr.* W. Watſon, *F. R. S. on the Electricity of Glaſs, that has been expoſed to ſtrong Fires.* *p.* 189

June 15. the SOCIETY adjourned to *Oct.* 26. 1749.

I. Viæ *Cometarum*, ſecundùm hypotheſin quæ ſtatuit illos curſu ſuo Parabolam circa Solem deſcribere, per *Nicolaum Struijck*, R. S. *Lond. S.*

Preſd. April 6. 1749. INdagationem curſus cometarum ex præcipuis aſtronomiæ ſublimioris partibus eſſe, nemo hodie aſtronomorum in dubium vocaverit: poſtquam vir ſummus *Iſaacus Newtonus* ante annos LXIII in lucem edidiſſet celebratum problema de via cometarum per tres obſervationes accuratas invenienda ex hypotheſi, illos curſu ſuo parabolam circa ſolem deſcribere, hac methodo uſus *E. Hallejus* vias XXIV cometarum per calculum determinavit in tabella, quæ reperitur in *Tranſactionibus Philoſophicis* N. 297. p. 1886. et in *Actis Eruditorum* anni 1707. p. 216. Revera autem ſunt XXI cometæ diverſi. Quanto labore id conſtiterit, docent ipſa *Halleji* verba, qui " undique enim, inquit, conquiſitis co-" metarum obſervationibus tabellam, immenſi pene " calculi fructum obtinui." Non opus eſt ut demonſtrem, quam neceſſaria ſit iſta tabella ſeculis venturis; ſufficiat teſtimonium autoris modo citati; " Huic tabulæ adornandæ nullis peperci laboribus, ut " perfecta prodiret; utpote poſteritati conſecrata; ac " cum ſcientia aſtronomica duratura."

Tanti viri veſtigio inſecutus eadem methodo alios XVIII cometas, qui in illa tabula non reperiuntur, undique conquiſitos annotavi, eo conſilio ut tandem ſingulorum tempus periodicum inveniri poſſet. Ne vero iſtæ obſervationes de viis cometarum caſu aliquo

perirent, illas nunc in publicam lucem emittere decrevi, ſimul officii mei eſſe ratus indicare quinam illas calculo arithmetico accommodaverint. Via cometarum anno 1723, et 1737, per calculum determinata eſt a *J. Bradley*. via cometarum 1744, a *J. Bets*. via cometarum 1699, 1702, et 1739, ab *Abbate de la Caille*. via ſecundi cometæ 1793, a D. *Klinkenberg*; via ſecundi Cometæ anno 1796, a *des Chezeaux*; primi Cometæ anni 1798, a *Maraldi*. Cumque ipſe tempore excluderer, obſervationes Cometarum conſpectorum annis 1533, 1678, 1718, et 1729, cum *C. Downes* calculo ſubjiciendas communicavi. Cometas vero ann. 1706, 1707, 1742, primum anni 1743, et ſecundi anni 1748, ipſemet ad calculum revocavi: quin etiam haud variis rationibus ductus, exiſtimo, ejuſdem anni 1748, menſe *Maio*, et hic *Amſtelodami*, et aliis *Europæ* locis, ſimul et eadem nocte tres cometas conſpici potuiſſe; cujus rei in hiſtoriis nullum aliud indubitatum exemplum extat. Addidi etiam Cometam exitu anni 1680, et initio anni 1681 conſpectum; quia in poſtrema *Iſ. Newtoni* editione emendationes leguntur, per quas ellipſis, quam circa ſolem movendo deſcripſit, determinatur.

Nunc etiam indicandum eſſet, quantum theoria ſingulorum Cometarum ab obſervationibus differat; ſed brevitati ſtudens hanc tractationem alii ſcripto, cujus editionem paro, ſervare malui, illud unice monens; ex XXXI obſervationibus, quas habeo, Cometæ ann. 1742, conſpecti, eſſe XXII quarum longitudines vix unico minuto inter ſe differunt, et XXIII, quarum latitudines ne minuto quidem differunt.

Sequuntur viæ XIX Cometarum, quorum ſupra facta eſt mentio.

Tempus

Tempus Æquationis Perihelii Londini.						Nodus Aſcenſ.				Inclinatio Orbitæ.				Perihelion in Orbe.				Dif. Perih. a Sole.	Motus
An.		d	h	′	″		°	′	″	°	′	″		°	′	″		Part.	
1533	Junii	16	19	30	0	☊	5	44	0	35	49	0		☊ 27	16	0		20280	Retro.
1678	Auguſti	16	14	3	0	♒	11	40	0	3	4	20		♒ 27	46	0		123802	Dir.
1699	Januarii	2	8	22	19	♒	21	45	35	69	20	0		♏ 2	31	6		74400	Retro.
1702	Martii	2	14	12	19	♊	9	25	15	4	30	0		☊ 18	41	3		64590	Dir.
1706	Januarii	19	4	56	0	♈	13	11	23	55	14	5		♊ 12	36	25		426862½	Dir.
1707	Nov.	30	23	43	6	♌	22	50	29	88	37	40		♊ 19	58	9		85904	Dir.
1718	Januarii	4	1	14	55	♋	7	55	20	31	12	53		☊ 1	26	36		102565	Retro.
1723	Sept.	16	16	10	0	♈	14	14	16	49	59	0		♌ 12	15	20		96942	Retro.
1729	Junii	12	6	35	91	♒	10	35	15	77	1	58		♒ 22	16	53		906980	Dir.
1737	Januarii	19	8	20	0	♏	16	22	0	18	20	45		♒ 25	55	0		222821/2	Dir.
1739	Junii	6	9	59	49	♈	27	15	14	55	42	44		♑ 12	38	40		67358	Retro.
1742	Januarii	28	4	20	50	♊	5	34	45	67	4	11		♏ 7	33	44		765551/2	Retro.
1742	Decemb.	30	21	15	16	♊	8	10	48	2	15	50		♑ 2	58	4		838111/2	Dir.
1743	Septemb.	9	21	16	18	♈	5	16	25	45	48	21		♐ 6	33	52		52157	Retro.
1744	Februarii	19	8	27	0	♌	15	45	20	47	8	36		♊ 17	12	55		22206 1/10	Dir.
1747	Februarii	17	11	44	38	☊	26	58	27	77	56	55		♈ 10	5	41		229388	Retro.
1748	Aprilis	17	19	25	4	♏	22	52	16	85	26	57		♏ 5	0	50		840662/3	Retro.
1748	Junii	7	1	24	15	♌	4	39	43	56	59	3		♈ 6	9	24		655251/2	Dir.
1680	Decemb.	7	23	9	0	♍	2	2	0	61	6	48		♐ 22	44	25		617	Dir.

Diſtantiæ autem Periheliæ æſtimantur in ejuſmodi partibus, quales mediæ diſtantiæ terræ a ſole habet centies millenas.

II. Epiſtola à *Joh. Jacobo Hubero* M. D. ad *Cromwell Mortimerum* R. S. Secret. de *Cadavere aperto*, in quo non extitit *Veſica fellea*; et de *Sterno gibboſo*.

Read April 6 1749.

NON ſine aliquo literario munuſculo ad te celeberr. *Mortimere*, adire fas eſt, virum humaniſſimum quidem, ſed eundem etiam talium rerum avidiſſimum, quibus aliqua pars illius cognitionis contineatur, in qua augenda et publicanda illuſtriſſima Societas, cujus tibi acta commiſſa ſunt, elaborare ſolet. Supereſt, ut hic aliquid invenias ab illo inſtituto non abhorrens. Volui certe aliquem tibi guſtum quaſi dare, quid, præter ſcopum primarium, fabricam corporis humani docendam Medicinæ, Chirurgiæ præſertim ſtudioſos, ſpectare in quotidianis cadaverum humanorum ſectionibus, in *Theatro Collegii* apud nos *Carolini* inſtitutis, conſueverim, et cujus generis obſervationes expectari porro, ut in rebus humanis, a me poſſint.

Obſervationes autem e pluribus duas hic ſpeciminis et guſtus cauſa breviter deſcribam, unam quæ vitiatam, eoque ipſo ſingularem ſiſtit partis corporis humani ſtructuram, ſimulque uſum arti ſalutari præſtare nonnullum videtur; alteram, quæ œconomiæ corporis noſtri ſingularem præbet mechaniſmum, quo etiam phyſiologorum diſcrepantes de bile cyſtica ſententiæ

tentiæ conciliari forte poterunt. Hepar hæc exhibet, veſiculæ fellcæ penitus expers.

FEMINÆ cadaver erat, ſexaginta circiter annorum, demonſtrationibus anatomicis inſerviturum, proximo anno in auditorium *Carolinum* inter plura alia allatum, in quo reperi magnum valde hepar, et præter morem craſſum; ſed lobum ejus dextrum parte concava omni carentem. Nullum nec ſulci nec excavationis pro recipienda veſicula fellea offerebatur veſtigium, ſed univerſus lobus ille erat ab utraque parte, tam quæ inteſtina attingit, quam ab altera, quæ diaphragmati ſe accommodat, lævis, æqualis, atque in primis tumidus, utrimque convexus atque eminens, et quaſi rotundus. Uti in hoc lobo, ita et in omni alia hepatis parte veſiculam felleam fruſtra quæſivi: nec quidquam vicinæ partes referebant cum veſicula comparandum, aut condi bilis ſecundarii vices defungens; contra pro more partes reliquas omnes vidi formatas. Iſte vero veſiculæ defectus ductus hepatici amplitudine, præter omnem conſuetudinem magna, reſarciri videbatur, quæ digitum minimum admittebat. Ille quamvis juſto, et ſuo loco conſtitutus, ordinariaque via incedens, in eo tamen erat ſtructuræ ſingularis, quod tunica craſſitie ſua arteriarum tunicis fere eſſet æqualis: non illa tamen alba, ſed tota quanta ſublutea, intus villoſa, ex punctulis ſeu exilibus maculis, totidem, puto, folliculos ſimplices referentibus, non paucis notata. Ab hepate aduſque duodenum eandem ſervabat ductus ille diametrum, ſicque cum vena portarum fere confundebatur: ubi vero duodeni tunicas attigerat, eaſque ſubierat, ſe poſuit mox nimiam illam amplitudinem, et conſuetæ papillæ, in duodeni cavo eminentis miniſterio fuam

quæſivit,

quæſivit, et per omnem mulieris vitam, puto, habuit exonerationem. Pori in hepate biliarii, ſeu rami ductus illius magni conſpiciebantur plures, ab utroque lobo confluentes, arteriarum in morem ampli valde, et ad ultimam fere hepatis peripheriam facile proſequendi, extus lutei omnes intus bile infarcti. Amaram ſat continebant bilem, nec copia paucam ductus omnes, et præſertim magnus ille, extra hepar formatus. Illam ductus amplitudinem condi ſeu veſiculæ felleæ loco fuiſſe, arbitror, et illius uſus, uti in eo in immenſum diſtento bilis, in hepate ſecreta, nec omnis ſtatim excernenda immorari commode poſſet, et ibidem mora ſua reddi acrior; atque tunc demum, quando verum digeſtionis tempus ingruebat, evacuari copia et acrimonia præſtantior. Præſtare ut potuerit hæc ductuum amplitudo condi officium, adjuvabant porro folliculi ſimplices, per omnem ductus magni tunicam intus diſperſi, blandum pro natura ſua effundentes humorem, quo univerſus ductus ab acrimonia remanentis bilis defenderetur, ſicque ibidem ad juſtum majoris evacuationis tempus ſervari ſuperflua commode poſſet. Similem itaque ſtructuram referebant ductus illi ampliores, qualis veſiculæ felleæ ordinario eſſe ſolet.

Hoc exemplum, rariſſimum quamvis de novo me declinat ab eorum phyſiologorum ſententia, qua vel veſiculæ tribuitur ſtructura propria, ad ſecernendam bilem ſuam apta, vel ductus aſſumuntur cyſt-hepatici vel hepatico-cyſtici, et ita ſimplicis condi officium denuo adſcribo veſiculæ felleæ, quod in diſſertatione mea inaugurali jam monui.

Ob argumenti affinitatem hoc inſuper hic addam; vidiſſe me Argentorati ante hos xv annos in recenti cadavere

cadavere humano ductum cysticum atque cholodochum ita distentos, qui facile admitterent digitum. Calculis vero debebatur valida illa amplificatio haud paucis, in vesicula generatis. Aliquot eorum in ductu adhuc hærebant, nucis avellanæ magnitudinem æquantes, molles tamen, et ductus se aliquo modo accommodantes. Erat autem ductus hepaticus de more constitutus.

ALTERA quam tecum, clarissime *Mortimere*, et si ita videatur, cum omnibus communicare placet, observatio de gibboso sterno agit, ab externa demum vi et incauta tractatione, non ab ipsa natura deformi configuratione producta. Non unica sed repetitis in diversis cadaverculis observationibus pectus perspexi præter omnem consuetudinem configuratum. Præ reliquis deforme erat pectus infantis octo hebdomadum, sequentem in modum: valde prominebat os pectoris gibbosum, quod ita a lateribus erat pressum, uti vix recederet a sellæ equinæ figura. Costarum suprema rum duabus vel tribus exceptis, partes anteriores intropressæ conspiciebantur intra pectus ab utroque latere, plures tamen sinistri lateris quam dextri, ubi debiles sunt valde atque molles, et cum cartilaginibus sterni committuntur. Et in primis cartilagines excavatam extus referebant figuram. Atque ita fere diffractæ adparebant costarum aliquot. Una tamen præ altera exilibus intervallis erat magis intropressa. Aperto demum pectore plures vidi costas, cavum pectoris versus gibbosas; quarum cartilagines tuberculis suis quasi nodosæ factæ erant, ideoque non parum contulerunt ad angustandum præter morem pectoris cavum. Unde facile erit cuique ad intelligendam infantum

infantum phthiſin, qua miſeri illi ita deformati vitam amiſerunt. Id porro pulmones, pleuræ circumcirca adnati atque infarcti, quales tunc reperi, ſatis confirmarunt. Cogitando inquirens in magni vitii hujus, aliquoties jam in diſſecandis infantibus a me obſervati, et quod in vivis etiam animadverti, cauſam, et ſedulo contemplando pectus hocce deforme, atque comparando illud cum annotationibus meis, ex aliorum cadaverculorum ſimilem in modum vitiatorum ſectionibus deſumtis, in veram tandem tantæ deformitatis et tam noxiæ cauſam incidi. Infantum ſcilicet curatricibus omnem hanc culpam, aio, eſſe adſcribendam. Non ſatis enim cognita eſt iis ſtructura tenellorum corpuſculorum plaſtica: nec debite perpendent luſus omnes, quibus vel placare moroſulos, aut geſticulatione vel ſaltatione exhilarare vivaciores infantulos conantur, unde diverſas excogitant tractationes. Noxia præ aliis ea eſt, quando ſiniſtræ manui ſuæ nates infantis imponunt, et antrorſum ita inclinatum paulum infantis truncum dextra ſua, pectori applicata, expanſis digitis ſuſtinent, atque ita ſubinde miſerum corpuſculum in altum tollunt, atque deorſum labens illud pondus omne manu ſuſtinent dextra. Eo enim haud raro fit, uti ſuffultæ manus veſtigia tenello pectori, et vi facile cedenti imprimantur. Antequam in dictam mox deformitatis illius cauſam inciderem, ad coſtarum foveas aliquot diſtinctas non attendi. Jam vero rite perpenſis omnibus certo comperi, eſſe illas depreſſiones ſeu foveas quinque curatricis, ſeu magis deformatricis, digitorum veſtigia, pectori infantis tandem impreſſa. Mea enim applicata pectori infantis manus dextra diductis pauxillum digitis exactè reſpondebat depreſſionibus illis: quarum

quatuor

quatuor erant in ſiniſtro pectore pro digitis, quinta vero eademque maxima dextrum deformabat pectus, pollicem recipiens. Quam itaque perverſus ſit ille, et deteſtandus tenellos infantes tractandi mos, ſatis ille frequens, ex ſupra dictis facile patebit, ſpero, cuique. Si vero ad illos perveniat hæc obſervatio, quod valde optarem, qui infantum curas gerunt, plures, puto, a vitio illo immunes præſtari in poſterum poterunt homines, ne prima ætate male tractati hoc vel alio modo non minus cauto, vel defigurentur; vel et tabe, vel alio morbo inde orto conſumantur. Simillimam narratæ obſervationem feci nupera hyeme in puella duorum annorum. Et uti jam monui in vivis etiam corporibus animadverti ſimilia. Cum *Rachitide* cæteroquin minime confundenda eſt deformitas iſta.

Dabam Caſſellis Jan. 31. 1747.

Joh. Jac. Huber.

III. *The Operation of* Lithotomy *on* Women, *by Monſ.* le Cat. *M.D. & F.R.S.*

Tranſlated from the French *by* T. S.

Read April 6. 1749.

THE lateral Way of cutting for the Stone, which I have uſed on Men ſince 1732, naturally led me, in the Year 1735, to cut the Widow *Neel*, a Farmer near *Yvetot* in the *Pais de Caux* in the ſame manner, as has been ſeen in the Obſervation. In this Operation the common grooved Staff ſerved me as a Director; and having

made the Inciſion, on the left Side of the *Urethra*, with the ſtrait grooved Knife, which I uſed that Year in cutting Men, I withdrew the grooved Staff, and introduced the Groove of the Knife.

Immediately after this Operation, I ſhorten'd the Work, by reducing the three Inſtruments to two. For that Purpoſe I contrived to add to the common Gorget *AA*, *Fig.* 1. and 2. TAB. I. a grooved Staff *BB*.

After placing and tying the Patient in the ſame manner as for cutting Men, I at once introduce into the *Urethra* the End *B* of the Gorget, which conſtitutes the grooved Staff, I turn the Groove towards the Patient's left Buttock: On this Groove I puſh the Knife (*Urethro-ciſtitome*) *Fig.* 3. which is not grooved, nor ſo broad as that which I made uſe of in 1735 on the Widow *Neel*. Having laid open the Neck of the Bladder, I lay aſide the Knife, and thruſt the Gorget farther into the Bladder; for Example, as far as *C*. Then I paſs the Fore-finger on the Gorget into the Bladder, to dilate the Neck; which done, I introduce the Gorget as far forward as is neceſſary, and on it the *Forceps*. The reſt of the Operation is performed as on Men.

The firſt of the Sex, whom I cut in this laſt Method, as appears by my Journal, is *Magdalen le Marchand* of the *Pais de Caux*, aged 22, cut in *May* 1738. I extracted a large Stone from her, and ſhe was cured in ten Days.

Since that time I have conſtantly practiſed this Method, which has ſucceeded perfectly well. When the Stones were little, the Patients were cured in a few Days: But here is one, whoſe ſpeedy Cure has ſomewhat ſurpriſing in it; inaſmuch as I really believe it the only one which has happen'd ſo.

Mary

Mary le Comte of *Diepdal* near *Rouen*, aged 12, cut the 24th of *May* 1740, had a Stone of a middling Size. In three Hours ſhe retain'd her Urine, ſo as not to diſcharge it but voluntarily. I thought it was the pretty common Effect of the inflammatory Swelling, which frequently happens after the Operation; and that the Suppuration would ſoon relax theſe Parts, and open the Wound; but I was miſtaken. There was not the leaſt Suppuration. *Mary le Comte* perform'd all the Functions of this Organ, as uſual; and being tired of the Bed, to which ſhe was confined againſt her Will, ſhe got up the third Day, in good Health, without any Accident ſupervening.

At the ſame time that I was labouring to improve the Manner of cutting Women, and ſhorten the Operation, I contrived another Gorget (*Fig.* 4.) which, beſides the grooved Staff of the former, contain'd within it the cutting Inſtrument, which was to make the Inciſion or Enlargement; that is to ſay, the three Inſtruments in one: And this Inſtrument was attended with this Advantage, that it could ſerve for Men as well as Women. One Hand is ſufficient to perform the Operation with this Inſtrument; but as the other Hand became in a manner uſeleſs; and moreover, as it is probable that a Perſon can better depend on an Inciſion made directly with the Hand, than on thoſe which are made by Machines or Springs. I have not hitherto uſed this Inſtrument; tho' poſſibly the Habit I had contracted of uſing the others has ſome Share herein. However that be, I have annexed the Figure and Deſcription of this Gorget, that thoſe who like it, may make uſe of it.

TAB. I. *Fig.* 4.

Explanation of the Figure of the Gorget, *which Mr.* le Cat *calls* Gorgeret Urethro-ciſtitome.

A, A Ring, for paſſing the middle Finger of the right Hand, which graſps the Handle *G*.

B, Another Ring which is ſlid by the Fore-finger towards *d*, to puſh the Blade *ab*, out of the Groove *EF*. The Figure repreſents the Inſtrument in the State in which it is at the very Inſtant when the Inciſion is made into the Neck of the Bladder. The ſame Fore-finger draws the Piece *B* back towards *A*, when the Operator intends to make the Blades return into the Groove *F*; where they lie hid, while he introduces the Inſtrument from *D*, as far as *Ff* into the *Urethra*.

The Groove *FE* is cloſed or covered from *d* to *e*, in order to ſecure the Pieces *a*, *b*, *c*, *d*, *e*, in Situation.

The Pins, which bind the Hinges *a*, *b*, *c*, muſt not be in the Center of the Pieces, but as they are expreſſed in the Figure; where *b* is pretty near the outer Edge, and the other two *a*, *e*, on the oppoſite Side; to the end that, when the Ring *B* is thruſt forward, the Hinge *b* may bend, and iſſue out of the Groove *F*, by making the Angle *abc*.

IV. De *Barometrorum* cum *Aëris* et Tempestatum mutationibus consensu: Auctore *Sam. Christiano Hollmanno*, Philos. in Acad. *Gottingensi* Profess. publ. ordin. et R. S. *Lond.* S.

Read April 23. 1749.

Difficultatis plena res adhuc visa est veram mutatæ mercurii barometrici altitudinis causam consensusque adeo cum subsequentibus tempestatum mutationibus rationem et modum explicare. Neque omni difficultate rem carere tot præstantissimorum virorum adhuc excogitatæ hypotheses satis indicant. Inter has vero, quæ occasione controversiæ inter *Schellhamerum* et *Ramazzinum* ea de re exortæ, a *Leibnitio* excogitata, et publici juris passim facta est, reliquis fere omnibus anteferri a multis cœpit. Ostensum vero jam in his præsentibus Transactionibus a doctissimo *Desagulierio* satis est, legibus hydrostaticis *Leibnitianam* isthanc hypothesin adversari*: ut adeo mirum sit, a tot aliis ab illo tempore eandem adhuc potuisse defendi; imprimis, quum et naturæ phænomenis eandem parum convenire, fere in propatulo sit. Quodsi illa enim causa descensus ascensusque mercurii in barometris esset, quam *Leibnitius* allegavit; neque prius, aut non multo saltem prius, mercurius posset descendere, quam guttæ pluviæ per incumbentem atmosphæram descendere cœpissent: neque prius iterum ille posset ascendere, quam descendere illæ desiissent: quod utrumque

* *Vide* N. 351. p. 570, *et seq.*

utrumque vero experientiæ omni reclamare, illis ſatis notum eſt qui ad mutationes barometricas vel per unum alterumve menſem ſolum attenderint. Non raro enim tribus quatuorve integris diebus mercurius ſenſim jam ante incipit deſcendere quam vel guttula ex aëre ambiente decidat; et aſcendere iterum, etſi integros ſæpe dies adhuc pluat. Imo mercurius in baroſcopiis ſæpe quoque *deſcendit*, licet *nulla* plane inſequatur pluvia. Neque guttulæ cadentes pluviæ in fine deſcenſus ſui *aërem ſuccumbentem* ita premunt, quemadmodum pondus in experimento *Leibnitiano* per aquam deſcendens, *fundum vaſis* ſui, in quo deſcenderat; neque adeo eodem modo, ac hoc quidem vaſi ſuſpenſo, *reddere* aëri *æquilibrium* ſuum amiſſum poſſunt. Adeo omnia in experimento *Leibnitiano* naturæ ſunt diſformia et diſſona, ut anceps hæream, num magis *Leibnitii*, viri ſuo alias merito magni ingenium an cœcum potius aſſeclarum aſſenſum mirari debeam. Accedit circa ipſum experimentum cauſæ, quam vocant, *fallaciam* a *Leibnitio* eſſe commiſſam, quando mutati nempe æquilibrii illam eſſe exiſtimavit, quod ſolida in fluido deſcendentia, durante deſcenſu ſuo in fluidum ambiens non gravitant. Experimentum enim tum omnium ſuccedere optime deprehendi, quando corporis per aquam deſcenſuri, v. c. globi plumbei, diameter tubi lumine paulo minor eſt, integramque adeo tubi aqua repleti, cavitatem fere replet. Quoniam globus enim deſcendere nequit niſi ſuo ſimile aquæ volumen loco ſuo expellat, eidem adeo motum, a fundo vaſis recedentem, imprimat, totoque adeo deſcenſus illius tempore ejuſmodi aquæ volumen, quale globi cadentis magnitudini reſpondet,

niſum et impetum vi naturali corporum centripetæ contrarium ab eodem accipiat; non poteſt non tubus crure bilancis ſuſpenſus totus etiam, quoad globi ille deſcenſus durat, in *tantum* æquilibrium ſuum *amittere*, donec globus ad fundum vaſis pervenerit, ſicque adeo aquæ aliquod volumen ſurſum porro pellere deſinat. Et experimentum ergo ipſum ex *Leibnitii* ſententia ſpectatum, vitioſum et erroneum, et ad explicandas mutationes barometricas præpoſtere admodum eſt applicatum. Taceo tandem in toto ſuo ratiocinio *circulum vitioſum Leibnitium* commiſiſſe. *Cauſam* enim redditurus eſt, quare aër, oriente vel imminente pluvia, levior evadat, mercuriumque adeo, in vaſculo barometri ſtagnantem, minus premat: et leviorem tamen jam factum eundem eſſe *ſupponit*: ſiquidem quamdiu aëris gravitas et vis elaſtica, qua ſuſtineri exhalationes in eodem hærentes hactenus poterant, eadem adhuc eſt, et manet, nunquam illæ vel in guttulas redigi, vel deſcendere per eundem, incipient. Sed pœnitet fere, in re adeo evidenti plura addere. De re ipſa tamen pauca adhuc adjicere liceat.

Magna pleriſque imprimis difficultas eſſe videtur, quæ cauſa ſit, cur aëre turbido, et exhalationibus variis *graviori* facto, mercurius in barometris ſubſidat; ſereno vero, adeoque et *leviori* reddito, idem, contra, in iiſdem aſcendat? quum omnia potius contraria ratione evenire debere videri poſſent. Verum quando hoc modo, uti a pleriſque quidem fieri videmus, quæſtio iſta formatur; annon tacite aliquid aſſumitur, et ſupponitur, quod neque evictum adhuc eſt, neque evinci facile poterit: graviorem ſcilicet aërem eſſe factum, quando turbidus et exhalationibus variis

repletus

repletus eſt; leviorem contra quando ſerenus iterum evaſit. Imo, annon tacite ſimul ſupponitur, vapores et exhalationes iſtas tunc demum aërem noſtrum *ſubire*, vimque adeo ejus elaſticam imminuere, quando in conſpectum noſtrum prodeunt? *abeſſe* vero, contra, aëremque adeo iiſdem liberum, et repurgatum eſſe, quamprimum viſui noſtro iterum ſe ſubducunt? Utrumque igitur hoc ſuppoſitum ſi negaverimus; maxima difficultatum hac in re adhuc motarum pars ſtatim evaneſcit. Negari vero utrumque graviſſimas ob cauſas poſſe, imo negandum omnino eſſe, videtur. Quis rerum enim peritus v. c. largietur, pulviſculos ſolares in aëre nos ambiente prius non adeſſe quam in camera obſcura in conſpectum noſtrum prodeant; adeſſe vero, iterum deſiiſſe, ex quo lumini aditus iterum undiquaque patefactus fuerit? Aut, ut tot alia, cum ſalibus acidis et alcalinis inſtituta experimenta hic prætermittamus, ſatis alias cognita, exemplo ad rem præſentem magis faciente utamur: quis eſt qui ignoret, in campana vitrea, orbi madido antliæ pneumaticæ impoſita, quamprimum agitari antlia incipit, nubeculas quaſdam ſtatim oriri, quæ, eodem illo aëre iterum admiſſo in eadem illa campana mox iterum diſpareant et evaneſcant? Jam nemo vero adeo harum rerum temere imperitus eſt, qui exiſtimet, exhalationes iſtas aqueas ex quibus nubeculæ iſtæ oriuntur, tunc demum campanam vitream ſubiiſſe quando in conſpectum noſtrum, imminuta vi aëris elaſtica, veniunt; aut nullo modo in eadem amplius ſupereſſe, poſtquam viſui noſtro iterum ſe cœperunt ſubducere, aëriſque, a quo antea ſuſtinebantur, poſtquam magis gravis et elaſticus iterum factus eſt, poris denuo condi. Adeſſe ergo exhala-

lationes iſtas novimus antequam propius ad ſe invicem accedant, et viſibiles nobis evadant; neque annihilari eaſdem, aut in aëre amplius non ſupereſſe ſcimus, quando magis diſſipatæ viſum noſtrum, ob ſubtilitatem ſuam maximam, fugiunt. Accedere autem propius ad ſe invicem incipiunt, quando vis aëris elaſtica in tantum imminuta eſt, ut ſuſtineri ab eodem, uti antea, commode nequeant; et recedunt iterum, viſumque noſtrum afficere deſinunt, quando prior ſua aeri gravitas, et vis elaſtica eſt reddita. *Utrumque* ergo hoc *ſimul* contingit, ut aëris nempe imminuatur vis elaſtica, eodemque tempore exhalationes, per eundem hærentes, ab eodem pauliſper dimitti, viſuique noſtro ſe ſiſtere incipiant: iterumque, ut aeri ſua redeat vis elaſtica, ſimulque exhalationes et vapores, in eodem hærentes, diſſipentur et evaneſcant; *alterum* tamen alterius *cauſa* dici propterea nequit: neque aër ergo ob eaſdem exhalationes alio tempore magis, alio minus gravis, etiam dici poterit.

Quodſi idem ergo in aëre, terram noſtram ambiente, contingere ſupponamus; maxima difficultatum pars jam corruit. Ponamus enim vim ejus elaſticam, quacunque etiam ratione id eveniat, de quo mox plura, imminui; exhalationes in eodem hærentes ſubſidere, et viſibiles fieri, neceſſe eſt: eadem vero quomodocunque reſtituta, vapores nubeſque, in eodem præſentes, iterum diſſipari, et evaneſcere. Eodem vero tempore, quo vapores iſti ſubſidentes in conſpectum noſtrum veniunt, mercurii quoque in barometris, imo ſæpe jam aliquamdiu ante ob eandem cauſam ſubſidere incipit; neque vapores tamen iſti ad hujus deſcenſum quicquam conferunt ſimili modo, quando vapores nubeſque diſparere per aërem, nos ambientem,

incipiunt, vel aliquamdiu etiam ante jam, mercurius in barometris incipit aſcendere; aëris tamen iſta ſerenitas æque minus cauſa aſcenſus mercurii in barometris eſt, ac mercurii aſcenſus cauſa ſerenitatis iſtius dici poteſt. *Cauſæ* ergo iterum dici meretur *fallacia* quando duorum iſtorum phænomenorum, quæ eodem circiter tempore contingunt, alterum referri ad alterum ſolet, alterum adeo pro alterius cauſa hactenus a pleriſque haberi.

Quo ad oculum vero hoc omne eo magis pateat, ſumatur (v. c.) cylinder vitreus, luminis trium aut quatuor circiter digitorum, utrinque apertus, et adeo longus, ut barometrum aliquod portabile immitti eidem poſſit. Cylinder ille imponatur aliquantiſper, ante experimentum, orbi, aqua corioque madido obtecto, antliæ, quo vapores nonnulli aquei ſubire aërem, eodem contentum, interea poſſint. Immittatur poſtea barometrum, exacteque cylinder ſuperne claudatur, quo aër poſſit exhauriri. Quodſi omnia rite curata fuerint, aërque incluſus antlia incipiatur educi; et *nebula* quædam ſtatim in cylindro iſto *oriri*, et *mercurius* barometri ſimul *ſubſidere*, incipiet: utrumque equidem, quod ſatis apparet, ab una eademque cauſa, neutrum tamen ab alterutro. Quodſi idem vero, qui ſubductus modo erat, aër ſtatim intra cylindrum vitreum iterum admittatur; aëri incluſo ſua mox redibit *ſerenitas*, mercuriuſque barometri ſimul, imo paulo adhuc citius, *aſcendet:* neque alterum tamen ab altero iterum pendere, ſatis patet. Imo neque illo caſu aërem *graviorem*, neque hoc *leviorem* factum eſſe manifeſtum ſatis ſimul eſt. Ita ars quodammodo imitatur naturam; ob miras tamen cauſarum naturalium complicationes nunquam exacte ſatis poteſt.

Etſi

Etſi ita primarium, vero hac in re offendiculum ſublatum eſſe videtur; res tamen tota hoc ipſo nondum confecta eſt. Diſquirendum enim adhuc reſtat, quibuſnam cauſis ita vel imminui vel augeri vis aëris elaſtica poſſit, ut illæ ipſæ mutationes inde proveniant? Non adeo difficile tamen videtur, quid hic reſpondendum ſit. Quibus enim conſtat, quam facillime *calore* quocunque accedente aër expandatur, et rareſcat, quantaque *ſolarium* perpendiculariter inprimis incidentium, *radiorum* vis ſit; illis vel ſola hæc cauſa forſan jam videbitur ſufficere ad aëris paſſim tollendum æquilibrium, ſi vel maxime nullæ aliæ, quæ variæ tamen adhuc eſſe poſſunt, accederent. Mittamus autem jam terræ, aëriſque adeo noſtri *diurnam*, circa axem ſuum *revolutionem*; mittamus etiam terræ aëriſque ſimul noſtri *motum* circa ſolem *annuum*; nihilque de tot in terræ noſtræ ſuperficie exiſtentibus *montibus ignivomis*, nihil de tot in aëre oriundis *fulguribus* et *fulminibus*, nihil denique de tot funeſtiſſimis terræ mariſque ſuperficiem paſſim, ipſumque adeo aërem, concutientibus *terræ motibus*, *ignibuſque* adeo e terra erumpentibus *ſubterraneis*, addamus, etſi ſingulorum mira in augenda, vel imminuenda, paſſim aëris vi elaſtica poteſt eſſe efficacia: atque unum quod præ cæteris memoratu dignum eſſe videtur, in præſenti ſolum conſideremus.

Vim aëris terræ noſtræ ſuperficiem proxime attingentis elaſticam a pondere aëris incumbentis imprimis pendere ſatis inter omnes conſtat. Pro majori ergo aut minori incumbentis columnæ aëreæ altitudine aërem inferiorem magis aut minus etiam elaſticum eſſe, ex diverſa barometrici mercurii in montibus magis minuſque excelſis, lociſque terræ depreſſioribus,

altitudine, ſatis non minus eſt notum. Neque minus tandem inter omnes conſtat, primariam fluxus refluxuſque marini cauſam lunam imprimis noſtram eſſe. Quocunque vero modo etiam mirabile hoc phænomenum a lunari corpore in terra noſtra efficiatur, de quo in præſenti non attinet ſpeciatim agere; id certe dubitatione omni videtur carere, lunam in terræ noſtræ *maria*, quocunque etiam modo agat, non poſſe agere, niſi et in *aërem*, inter ipſam terramque noſtram *interjacentem*, eodem ſimul tempore et modo agat. Quodſi corporum ergo fluidorum mobilitas rationem denſitatis, denſitas vero eorundem rationem gravitatis ipſorum ſpecificæ, habet; aër, terræ proximus, qui aqua dulci 860, circiter levior eſt, marina aqua 900 circiter vicibus erit mobilior: adeoque et eadem illa cauſa, quæ maribus noſtris adeo conſtantem et ordinatiſſimum motum imprimis, iiſdem agendi viribus, aëris noſtri altitudinem nunc augere, nunc imminuere, multo facilius poterit. *Fluxu* ergo quaſi quodam in aëris determinata regione oriundo, non poſſunt non columnæ aëreæ eodem in loco *altiores* fieri, eoque ipſo et vis elaſtica, inferiores, cæteris paribus, augeri; *refluxum* autem quodam exorto, *altitudinem* columnarum aërearum eodem in loco *imminui*, ſicque adeo, cæteris iterum paribus, inferioris aëris vim elaſticam decreſcere, neceſſe eſt. Atque hæc altitudinum differentia eo major forſan eſt, quo magis aëris, in extremis atmoſphæræ noſtræ limitibus rariſſimi, gravitas ſpecifica, a gravitate ſpecifica aquarum noſtrarum marinarum, ipſiuſque aëris inferioris, vincitur et ſuperatur. Quo minus vero vices ſuas alternas aëris ille fluxus, refluxuſque æque ordinate et conſtanter, ac marium ille æſtus reciprocus,

reciprocus, obſervet; præter maximam ejuſdem fluiditatem, ob quam a leviſſimis agitari cauſis poteſt, antea enumeratæ cauſæ proculdubio efficiunt, quibus miras quippe, omni fere tempore, ſive in hac, ſive in alia, globi noſtri terraquei parte, aëris agitationes et perturbationes oriri, ſatis conſtat. Ab his ergo cauſis omnibus, ſimul ſumtis, columnarum aërearum locis temporibuſque diverſis mutatæ altitudines, atque ab his porro in aëre inferiori pendentes mutationes, cum ipſis phænomenis barometricis erunt rep. tendæ.

Reſtat unicum, paucis tangendum. Solicitos multos eſſe videmus, de *præſagiendis* ex mercurii in barometris ſive aſcenſu ſive deſcenſu, *tempeſtatibus*, deque *regulis* eum in finem certis condendis laborare: quum unicus hic eſſe videatur, quem rerum naturalium non ſatis alias periti expectare a mirabili hac machina uſum poſſint. Atque utinam vel de eo ſolum certi aliquid jam conſtaret, ſiquidem magna jam hoc ipſo rebus humanis afferri utilitas poſſet. Non videntur vero, quæ ita conjuncta eſſe volumus, inter ſe neceſſario eſſe connexa. Baroſcopia enim noſtra, præter incrementum vel decrementum, vis elaſticæ aëreæ nihil nobis proprie, et per ſe, indicant, aut indicare poſſunt; tempeſtates vero omnes a varii generis exhalationibus, eodem tempore vel ſimul in aëre exiſtentibus, vel non exiſtentibus, vel non eadem ſaltem copia ſemper præſentibus, unice pendent. Fieri ergo poteſt, ut, quo vis aëris elaſtica forte imminuitur, mercuriuſque adeo in barometro deſcendit, ſufficiens exhalationum craſſiorum in aëre copia ſimul adſit, hicque turbidus inde evadat, vaporeſque adeo porro ſubſidere, imo in majores minoreſve guttas pluvias coaleſcere, incipiat, aliaque ejuſmodi phænomena conſequantur.

conſequantur. Fieri vero æque facile poteſt, ut, aëris elaſticitate licet imminuta, ob ſufficientium tamen exhalationum in eodem defectum, nulla fere ſenſibilis tempeſtatis mutatio ſubſequatur. Idem contraria ſe ratione habere poteſt ob nimiam exhalationum in aëre copiam; licet vel maxime mercurius aſcendens, auctam vim aëris elaſticam eſſe, evidentiſſime oſtendat. Quoniam ergo *caſu* quaſi quodam hæc ſolum *coincidunt*; nulla certa ex mercurii ſive aſcenſu ſive deſcenſu, futuræ tempeſtatis capi præſagia poſſe videntur. *Negative* tamen inde ſatis tuto videtur poſſe concludi. Conſtans enim fere obſervationum docet conſenſus, ſi deſcenſum mercurii turbida ſubſecuta tempeſtas fuerit, ſerenam prius non redire quam aſcendere mercurius iterum cœperit: aut ſi aſcenſus mercurii cum ſerena tempeſtate copulatus fuerit, nubilam pluviamque, aut huic ſimilem aliam, non ſubſequi, niſi deſcendere prius mercurius cœperit. Atque hoc æque magnum ſæpe in vita communi uſum habet, ac ſi *poſitive* ſemper poſſemus prædicere, qualis aſcenſum deſcenſumque mercurii tempeſtas præciſe ſit inſecutura. Lapſum tamen mercurii *frequentius* turbidam quam ſerenam; aſcenſum vero ejuſdem ſerenam magis, quam turbidam tempeſtatem inſequi, experientia multiplici non minus confirmatur: magnoque adeo uſui ſæpe eſſe poteſt, *tutius* in caſibus ejuſmodi obvenientibus eligere. Vento tamen ex plaga aliqua, inter boream zephyrumque intermedia ſpirante, pluviam turbidamque tempeſtatem frequentius vel oriri, vel ortam continuari, quam ſerenam, mercurio in barometris licet aſcendente, etiam in his regionibus, cum aliis notatu dignis, jam ſæpe mihi obſervatum eſt: de quo alias forſan plura.

V.

V. *A Letter from Captain* John Waddell *to Mr.* Naphthali Franks *Merchant, concerning the Effects of* Lightning *in deſtroying the* Polarity *of a* Mariners Compaſs; *to which are ſubjoined ſome* Remarks *thereon, by* Gowin Knight, *M. B. F. R. S.*

SIR, *Horſſydown, Feb. 22, 1748-9.*

Read April 13. 1749. AGreeable to my Promiſe I have here inclos'd you the Heads of our Misfortune, and have alſo ſent you one of the Compaſſes, and am, with great Eſteem,

SIR,

Your moſt obedient humble Servant,

John Waddell.

ON the 9th of *January* 1748-9. the new Ship *Dover*, bound from *New York* to *London*, being then in Lat. 47° 30′ North, and Longitude 22° 15′ Weſt, from *London*, met with a very hard Storm of Wind, attended with Thunder and Lightning, as uſual, moſt Part of the Evening, and ſundry very large Comazants (as we call them) over-head, ſome of which ſettled on the Spintles at the Topmaſt Heads, which burnt like very large Torches; and at 9 *p. m.* a ſingle loud Clap of Thunder with Lightning ſtruck the Ship in a violent manner, which

which disabled myself, and great Part of the Ship's Company, in the Eyes and Limbs; it struck the Mainmast about $\frac{2}{3}$ up almost half-through, and stove the upper Deck one Carling, and Quick-work; Part of which Lightning got in between Decks, started off the Bulk-head, drove down all the Cabbins on one Side of the Steerage, stove the lower Deck, and one of the lower Deck main Lodging-Knees.

Another Part of it went through the Starboard Side, without any Hurt to the Ceiling (or inside Plank); and started off from the Timbers four outside Plank being the Whale upwards; one of which Planks, being the second from the Whale, was broke quite asunder, and let in, in about 10 or 15 Minutes time 9 Feet Water in the Ship.

It also drew the Virtue of the Loadstone from all the Compasses, being four in Number, all in good Order before, one in a brass and three in wooden Boxes. The hanging Compass in the Cabbin was not quite so much disabled as the rest; they were at first very near revers'd, the North to the South; and after a little while rambled about so as to be of no Service. The Storm lasted five Days, we lost our Mainmast and Mizenmast, and almost all our Sails; arriv'd at *Cowes* the 21st of *January* in a very shatter'd Condition.

An

An Account of the Mariners Compaſs, *that was ſtruck with* Lightning, *and ſhewn at the laſt Meeting of the* Royal Society; *with ſome further Particulars relating to that Accident; communicated by* Gowin Knight, *M. B. F. R. S.*

WHEN I came to examine the Compaſs ſtruck with Lightning, I obſerved that the outward Caſe was joined together with Pieces of iron Wire, 16 of which were found in the Sides of the Box, and 10 in the Bottom. I applied a ſmall Needle to each of theſe Wires, and immediately perceived that the Lightning had made them ſtrongly magnetical; particularly thoſe that joined the Sides. All the Heads of the Wires on one Side of the Box attracted the North Point of the Needle, and repelled the South; whilſt all the Heads on the other Side attracted the South and repell'd the North. The Wires at the Bottom attracted the South and repelled the North; but it is not certain, whether this Polarity was any-ways owing to the Lightning; ſince it might be acquired by their continuing long in an erect Poſture.

In examining the Card, I found the Needle was vigorous enough in performing its Vibrations, but that its Polarity was inverted; the North Point turning conſtantly to the South. I then tried to take out the Card, to examine the State and Structure of the Needle: But the Junctures were every-where well-ſecured with Putty, and that grown ſo hard, that I was obliged to uſe ſome Violence, and at laſt broke the Glaſs. The Needle (if I may ſo call it)

 conſiſted

conſiſted of two Pieces of Steel Wire, each of which was bent in the middle, ſo as to make an obtuſe Angle; and the Ends of theſe Wires applied together, forming an acute one, the whole appear'd in the Shape of a Lozenge; in the Centre of which was placed the braſs Cap whereon the Card turned. And ſo far was it from being made with any tolerable Degree of Exactneſs, that there was not the leaſt Care taken either to bend the Wires in the middle, or to fix the Cap exactly in the Centre of the Lozenge: For, upon trying it with a Pair of Compaſſes, I found its greateſt Eccentricity to be full $\frac{2}{10}$ of an Inch. The Pin, upon which it turned was made of a Slip of Plate-Braſs ſharpened to a Point.

Beſides the Particulars already communicated to the Society, the Captain informed me, that he was obliged to ſail above 300 Leagues, after this Accident happen'd, without a Compaſs, till he arrived at *Cowes* in the *Iſle of Wight*; where being provided with one, he placed it in the Binacle, but was much ſurprized to find that it varied from the Direction it ſtood at when out of the Binacle nearly 2 Points. He removed the Binacle to different Parts of the Deck, but found that it always made the Needle to vary after the ſame manner when placed in it. He repeated the ſame Experiment lately in the River, with the like Succeſs; only that he obſerved, that the Variation of the Needle, when placed in the Binacle, was rather leſs than at firſt. It was natural to inquire if there was any Iron about the Binacle; but I was ſurprized when the Captain informed me, he had given ſtrict Charge to the Maker not to put ſo much as a ſingle Nail in it; and that he firmly believed

believed that there was not the leaſt Bit of Iron about it.

Being willing to beſatisfied of the Truth of a Circumſtance ſo very extraordinary, the Captain was deſired to ſend the Binacle to a Houſe in the City; where, in Company with the Captain, Mr. *Ellicot*, and another Gentleman, I tried it with a large Compaſs touched by my Bars; but finding no ſenſible Variation, we at that time deſiſted, thinking the Fact quite improbable: But having diſcovered the Effect which the Lightning had produced upon the Wires which faſtened the Sides of the Compaſs-Box, I was induced to examine the Binacle a ſecond time; which I did with a ſmall Compaſs, and with great Care, in every Part; and at laſt, about the middle of the Binacle, I found it to vary very ſenſibly, but could not diſcover any Nails or Iron any-where thereabouts; till, turning it up to examine the Bottom, I there found 3 or 4 large Nails, or rather Spikes, driven thro' it to faſten the upright Partitions in the middle of the Binacle.

It would not be difficult to explain why any Needles, under the like Circumſtances with thoſe above-related, ſhould be render'd uſeleſs by Lightning, tho' the Needles themſelves had remained unhurt. So many iron Wires made ſtrongly magnetical would doubtleſs have effected it; and 3 or 4 large Nails in the Binacle, if made magnetical, would alone have been ſufficient to have done it. But I have already taken notice that the Polarity of the Needle was inverted by this Accident; and I would further obſerve, that all Needles conſtructed after this manner are liable to be render'd uſeleſs, not only by the

Lightning's deſtroying their Virtue, but alſo by its placing it in a particular Direction; *e. g.* if the Lightning ſtruck the Needle in the Direction of either of the two parallel Sides of the Lozenge, it muſt ſtrike the other two Sides very obliquely; whereby the firſt two Sides may have their Polarity deſtroyed, and a very ſtrong one given them in the contrary Direction; whilſt that of the other Sides, if it be inverted, will be very weak; but it is probable that the Virtue would be placed obliquely in the Direction of the Stroke; in either Caſe, theſe two Sides can contribute but very little (if any thing) in directing the Card; and if the two firſt Sides only are capable of acting upon it, it will point in the Direction of thoſe Sides, which will produce a Variation of about 4 Points.

It may further be obſerved that a Needle would not continue long in this State, but would every Day grow more and more regular; becauſe if the Virtue be placed obliquely, it generally turns itſelf in the Direction of any Piece of Steel that is long and ſlender; and that may be the Reaſon why this Card is now become regular, except that it is inverted.

The Wires that join the Box ſeem weaker than when I firſt examin'd them; which makes it very probable that they might be vaſtly ſtronger when firſt ſtruck with the Lightning: And the ſame may be likewiſe true, in regard to the Nails in the Binacle; which may account for the Experiments not anſwering exactly the ſame as at firſt.

From what has been ſaid it appears, that this Form of Needles is very improper, and ought to be changed for

for that of one ſtrait Piece of Steel; and then if a Needle ſhould be inverted it might ſtill be uſed. It alſo ſhews the Abſurdity of permitting Iron of any kind about the Compaſs-Box, or the Binacle. Whoever conſiders the whole Deſcription here given of this Compaſs, I am perſuaded, he will eſteem it a moſt deſpicable Inſtrument: How then muſt any one be ſhocked to hear, that almoſt all the Compaſſes, made uſe of by our trading Veſſels, are of the ſame ſort! the Boxes all joined with iron Wire, and the ſame Degree of Accuracy obſerved throughout the Whole!

This I am credibly informed, is the Caſe; and that for no other Reaſon, but that one of this ſort may be purchaſed for *5s.* and it will coſt about *2s. 6d.* more to buy a tolerable good one. So that the Lives and Fortunes of thouſands are every Day hazarded for ſuch a trifling Conſideration.

VI. *A Letter from Sir* Hans Sloane *Baronet, late Pr. R. S. to* Martin Folkes *Eſquire Pr. R. S. containing Accounts of the pretended* Serpent-ſtone *called* Pietra de Cobra de Cabelos, *and of the* Pietra de Mombazza *or the* Rhinoceros Bezoar, *together with the Figure of a* Rhinoceros *with a* double Horn.

SIR, *Chelſea, April* 19, 1749.

Read April 20. 1749. I HERE ſend you to be communicated to the *Society*, if you think proper, an Account of two pretended Stones, ſaid to be found in the Head of the moſt venomous Snake of the *Eaſt Indies* called *Cobra de Cabelo*, together with an Account of what I have heard, and what I believe they really are. The firſt I have heard and do believe to be a Stone found in the Stomach or Inteſtines of the Rhinoceros; not, that I know, taken notice of by any Natural Hiſtorian, excepting *Redi*. The Place where it is ſaid to be found is on the South-Eaſt Coaſt of *Africa*, according to the Information *Redi* had of it, and from which Place I had the two Horns figured in theſe *Tranſactions*, N°. 470, by Dr. *Parſons*, which were tied together acroſs, the better I believe to preſerve the ſhort Skin that connected them on the Noſe of that Animal, ſo that the ſtrait and crooked Horn might appear diſtinct, as they do in a very intire ſmall braſs Medal of *Domitian* in my Collection. Whether

Whether the Rhinoceros, who bore these two Horns, be a distinct Species of that Animal from that of *Asia*, future Travellers must determine

These Horns were given me by my worthy and ingenious Friend and Acquaintance *Charles Lockyer* Esq; who was (as I have been told) sent in a Ship of Strength with a Power given him by the *East-Indian* and *African* Companies, to go on their Affairs to that unfrequented Coast which common Travellers have been afraid to go to because of the Barbarity and Cruelty commonly said to belong to its Inhabitants, and with which the *Egyptians*, and from them the *Greeks* and *Romans*, had a greater Intercourse and Knowledge than with the Southern Parts of *Asia*, where that Animal is generally found with only one Horn. I am,

SIR,

Your humble Servant,

Hans Sloane.

Pietra *de Serpenti di* Mombazza Redi *Esperienze*, *Nat.* p. 59, TAB. II. *Lapis Serpentis de* Mombaza, *Edit. Latin.* p. 82.

DR. *Waldo*, an old Acquaintance of mine, went into the *East Indies*, on purpose to search after and collect the natural Productions and Curiosities of those Parts, especially such as related to the Cure of Diseases, which he sent from time to time to his Sister he left in *London*, with Directions to shew them to the Earl of *Pembroke*, Sir *Godfrey Kneller*, and

and myſelf, to ſell. The two former not caring to buy ſeveral of them, they fell into my Hands. Among the reſt which I purchaſed were ſome of theſe Stones, which were by him call'd Rhinoceros-Bezoars, which I ſuppoſed were taken out of the Stomach or Guts of that large Animal.

Theſe Productions or Bezoars, as they are commonly call'd, conſiſt of ſeveral Coats made up of ſeveral Parts attracted by their Centers, ſuch as the Stones of Fruits, and other indigeſtable Subſtances ſwallowed with its Food, after the manner of thoſe found in the Stomach and Inteſtines of Mankind, and other Animals. The uppermoſt Coat or Layer of this Bezoar is made up of ſeveral brown ſtriated ſmall Knobs or Tubercles ſomething like low Warts, diſtant from one another, and making its outermoſt Surface very unequal, as well appears by the Figure of it hereunto annexed, TAB. II. *Fig.* 1, and 2. different from the other Bezoars whoſe Surface is generally ſmooth. Thoſe I have of this Bezoar are of different Sizes and Diameters, the largeſt about the Bigneſs of an Orange, heavy, and as hard as Stone, and capable of being poliſhed.

Redi relates great Virtues belonging to them, as told by the Bringers of them from the *Eaſt Indies*; ſuch as, being tied to the Hip or Leg of a Woman in Travail, it helps her Delivery, and without Pain, even if the Child be dead; but with this Caution, that, immediately after the Birth, it ſhould be removed; for if it remains tied there, it brings away the Womb, *&c.* and the Woman dies.

This I believe to be attributed to them from their Center's being ſometimes looſe, and rattling within, like

like an *Ætites* or Eagle-ſtone, as ſome of thoſe I have do: Alſo that it is good for intermitting Fevers given in their Drink at the going off of the Fit; and that it is good for the Colic, and Hypochondriac Melancholy, as may be ſeen in that Author, who I think is the only one, that ſpeaks of it.

It has been the moſt rare of any of theſe Snake-ſtones, as they are call'd in the *Indies*, and ſo not taken notice of.

I was inform'd there was one in *Paris* offer'd, to that great Inquirer after natural Productions the late Duke of *Bourbon*, at the Price of 100 Piſtoles; to whom I ſignified by ſome of his Acquaintance, that I had more than one of them, and would make him a Preſent of one, which I afterward did, leſt he ſhould be impoſed upon by giving ſuch a Price, as ſome curious Perſons have often been in other Things of the like Nature.

Pietre *del Serpente* Cobra de Cabelo * Redi *Eſperienze, Nat. p.* 3. *Tab.* 1. *Lapides Serpentis* Cobras de Cabelo *dicti, Edit. Latin.* Pedra de Cobra, Kempfer. *Amœnitat. Exot. p.* 396. *Pierres de Serpent.* Biron *Curioſit. de la Natura, &c. p.* 72.

DR. *John Bateman*, my worthy Predeceſſor, formerly *Preſident* of the *College* of *Phyſicians* of *London*, told me, with great Admiration, that he had

* Which ſignifies in *Portugueſe*, the hooded Serpent, becauſe it has a Membrane about its Head which it can expand like an Hood: By others it is called the Spectacle-Snake; for on the back Part of its Neck is the Repreſentation of a Pair of Spectacles. *See* a Figure of one in *Kempfer*'s *Amœnit. Exotic. p.* 567.

had ſeen the great Effects (upon the Bite of a Viper) of the Snake-ſtone or Serpent-ſtone, as it is call'd, before King *Charles* II. who was a great Lover of ſuch Natural Experiments; and that he knew the Perſon poſſeſſed of the very Stone he had ſeen tried, who he believed would part with it for Money.

Upon my Deſire and Requeſt to ſee him, he came to me, and brought with him the Stone, which was round and flat, as the common ones brought by Merchants and others from the *Eaſt Indies*, about the Size of a mill'd Shilling, but thicker, for which he asked five Guineas, tho' it was broken. There are ſeveral of this Sort, figur'd in TAB. II. *Fig.* 8. *a*, *b*, *c*, *d*.

Dr. *Alex. Stuart*, who had been my Acquaintance for ſeveral Years, returning from the *Eaſt Indies*, brought from thence, among many other Curioſities, ſome of theſe Snake or Serpent-ſtones, together with this Account of them, which he had from a Father Miſſionary in the *Eaſt Indies*, 'that they were 'not taken out of a Serpent's Head, but made of 'the Bones of the ſmall Buffalo in the *Indies*' (by which their Coaches are drawn inſtead of Horſes); the Bones being half-calcin'd or chard by the Dung of the ſame Buffalo. He gave me ſeveral Pieces, with ſome of the Snake or Serpent-ſtones made out of them, and which I have in my Collection of ſeveral Shapes and Colours.

I think the firſt who gives any Account of them is *Franceſco Redi* at *Florence*, who had them from the Duke of *Tuſcany*'s Collections, and who, in his *Eſperienze Nat.* tells great Virtues of them, related by three *Franciſcan* Friers, who came from the *Eaſt Indies* in 1662. which were, that, being applied

plied to the Bites of the Viper, Aſp, or any other venomous Animals it ſticks very faſt till it has imbibed or attracted all the Poiſon (as a Loadſtone does Iron), as many People in the *Indies* believe, and then it falls off of itſelf; and being put into new Milk, it parts with the Poiſon, and gives the Milk a bluiſh Colour; of which *Redi* tells the Succeſs of thoſe he figured.

Kempfer, in his *Amœnitat. Exot. p.* 396. ſpeaking of this, ſays, it helps thoſe bit by Vipers, outwardly applied; and that it is not found in the Serpent's Head, as believed, but by a ſecret Art made by the *Brahmens*; and that, for the right and happy Application of it, there muſt be two ready; that when one has fallen off fill'd with the Poiſon, the other may ſupply its Place. They are commonly, as he ſays, kept in a Box with Cotton, to be ready when Occaſion offers.

Biron ſays, that if the Wound of the Serpent has not bled, it muſt be a little prick'd, ſo as the Blood comes out, and then to be applied as uſual. It comes from the Kingdom of *Camboya*.

Tab. II.

Fig. 1. A *Pietra de Mombazza* $2\frac{3}{4}$ Inches in Diameter, weighing $10\frac{1}{2}$ *oz.* 3 *dr.* 13 *gr.* with large Prominences or Emboſſments on the Outſide.

Fig. 2. another $2\frac{1}{4}$ in Diameter, with ſmaller Emboſſments on the Outſide.

Fig. 3. the ſame ſaw'd in two, and the Section poliſh'd, wherein appears a common Pebble *a*, of

an Aſh-colour, as the Core or Center on which this Stone was form'd.

bbbb, are ſeveral almoſt concentric Lines, nearly anſwering to the Shape of the Pebble in the Center, and reſemble the different Coats of an Onion, ſhewing the progreſſive Accretion of the ſeveral *Laminæ* or *Strata*, of which this Stone is compoſed.

cccc, pyramidal Spaces of a darker Colour, and more compact Texture than the intermediate lighter-colour'd Spaces, whoſe Baſes ariſe at the outer Circumference and form the Emboſſments there, and whoſe Points all tend towards the Center of the Stone; both the Outſide and Inſide of theſe Stones are of a light Oker-colour diluted with a little white; the Pyramids being about 2 Shades darker than the reſt of the In- or Outſide.

Fig. 4. another of the ſame ſort ſawn in two, in the Center of which is lodged a Fruit or large Seed, about the Size and of the Shape of an Acorn, having a thick Husk on the Outſide.

Fig. 5. a Coin of *Domitian* in ſmall Braſs, having on the Foreſide, the Figure of a Rhinoceros with 2 Horns growing out of his Noſe, the one above the other; which in the *Numiſmata Pembrokiana*, Part 1. TAB. XVI. *n.* 68. the Engraver has made like a Tusk or *Dens exertus* of a Boar, and in Part 3. TAB. 39. he has made the 2 Horns on his Noſe like 2 Tusks, and has likewiſe given him 2 Horns cloſe to his Ears; ſo that he has made him a Creature with 4 Horns; and therefore it was thought proper to give an accurate Copy of the

the Medal, in order to clear up that famous Paſſage of *Martial, Lib. de Spectac.* N°. XXII.

Namque gravem gemino cornu ſic extulit urſum,
Jactat ut impoſitas taurus in aſtra pilas.

Which has for many Ages puzzled the Critics, all thinking that the Rhinoceros was a real Unicorn or Animal, which never had any more than one Horn. *See* theſe *Tranſ.* N°. 470, *p.* 537. and beſide the double Horns, or *geminum Cornu*, in Sir *Hans Sloane*'s *Muſeum*, I am told Dr. *Mead* has got another *geminum Cornu* likewiſe from *Africa*.

Fig. 6. is the reverſe of the ſame Medal, with this Inſcription IMP DOMIT AVG GERM and in the middle SC

Fig. 7. is the Figure of the Rhinoceros magnified, that the Poſition of the 2 Horns might appear diſtinct and plain.

Fig. 8. *a, b, c, d,* repreſent the *Pietre de Serpente Cobra de Cabelo*, of an Aſh-colour and black. In that mark'd *b*, the dark Shade in the middle ſhews an Hollow, which was Part of the Cavity of the Inſide of the Bone. *e* and *f* are rough Pieces of Bones, half-calcin'd, porous, and not poliſh'd. The Figure and Deſcription of the Buffalo, whoſe Bones they uſe for this Purpoſe, are given in Mr. *Edwards*'s Hiſtory of Birds, to which he has ſubjoined the Figures and Deſcriptions of ſome few rare Quadrupeds. *Plate* 200.

VII.

VII. *Some Account of the* Rana Piſcatrix; *by* James Parſons *M. D. F. R. S.*

Read April 17. 1749.

IN ſome Parts of *Italy* this Fiſh is called *Roſpo*; in others *Bora*; and by the *Lombards Zatto*.

Lophius ore cirroſo, Petrus Artedus.

ὁ ἁλίας βάτον, βάλραχος ἁλίας. *Ariſtot.*

Rana Piſcatrix, by the following Authors; *viz. Bellonius, Rondelletius, Salvianus, Geſnerus, Charleton, Willoughby, Ray.*

Piſcatrix vel marina. Schonveld.

——— *vulgaris. Aldrovand.*

ALTHO' this Fiſh is already deſcribed by moſt of the Natural Hiſtorians, yet ſeveral of its Properties appear to have been overlook'd; and as I am perſuaded many of this Learned *Society* may not have ſeen it, I laid hold of this Opportunity to lay it before them, with ſome little Account, and Drawings, I believe nearer the Truth than any exhibited already; referring the Curious to the general Hiſtory of this Animal, as collected by *Geſner*; and to Sir *George Ent*'s Account and Diſſection of him, as deliver'd by Dr. *Charleton*, in his *Exercitationes de Differentiis et Nominibus Animalium*; whoſe Figure of him is copied by *Willoughby* with moſt of the Diſſertation, and which, if I miſtake not, was taken from *Salvianus* by Dr. *Charleton*, for the better Illuſtration of Sir *George*'s Diſſertation.

This Animal is four Feet three Inches long, and about nineteen Inches from Side to Side in the wideſt

Part. His Mouth is very wide, and his Teeth are ſet in Cluſters in both the upper and under Jaws, and not in regular Rows, as was the vulgar Opinion: They are long and ſmall like Spikes, moveable, and directed inward, in order to ſecure his Prey from eſcaping, after he has once laid hold on him. His lower Jaw is longer by far than his upper; having a large Capacity in the Skin of the former, to yield according to the Bulk of the Creature he ſeizes; for with this Jaw, and the external Cluſters of the Teeth of the upper Jaw, he holds it faſt, whilſt with another inner cartilaginous Jaw (whoſe Teeth correſpond with an inner Cluſter of Teeth in the upper) he chews and tears his Prey, ſwallowing it by degrees as he minces it; neither the under Jaw, nor external Row of the upper, having any Share in the Maſtication at all.

Altho' he is ſaid to be of the cartilaginous kind, his Head is as bony as that of any Fiſh; having rough ſpiny Ridges, ſerving as Eye-brows. Between theſe ariſe three black limber Twigs; the anterior is longeſt, the ſecond ſhorter, and the next ſhorteſt; each having at its Extremity a white flat Piece, with which, it is ſaid, he allures other Fiſh to approach near enough to ſeize on them. There are two others leſs conſiderable on his Back, between thoſe Fins or Webs, which, in him, muſt be call'd *humeral* Webs.

Theſe Webs are cartilaginous and fleſhy, and are ſupported by ſtrong Bones, analogous to the humeral Bones of ſome other Animals. Under each of theſe is a *Sacculus* or *Marſupium*, which runs up the Side of his Head, 28 Inches deep, and 6 Inches wide: Theſe

Theſe have not been duly taken notice of, except I think by *Bellonius*, who mentions two Holes, without adding any thing elſe about them. But they are of ſo ſingular a Nature, that I think there is ſome Encouragement to make the following Conjecture.

The branchial Holes are three on each Side, which are ſituated deep in the Mouth, and open into theſe *Marſupia*, the Sides of which are the *Brancheoſtegæ*, having ſeveral long ſlender cartilaginous Bones running longitudinally for their Support, analogous to the brancheoſtegal Bones of other Fiſhes; ſo that probably theſe Sacks may anſwer two Ends; firſt, to form the *Membranæ brancheoſtegæ*; and, ſecondly, to make a convenient Receptacle for the Young, till they are able to ſhift for themſelves. Perhaps the following Conjectures may ſerve to ſtrengthen this Opinion; for if this End was not to be anſwer'd, the *Branchiæ* might have been terminated near their Origin in the Mouth, as it is in other Fiſhes.

Authors have ranked this Fiſh among the cartilaginous Tribe, who are ſaid to be viviparous; but of this there are Diſputes among them as yet undetermin'd. Now if this Fiſh does not bring forth its Young perfect, there can be no Uſe aſſign'd to theſe Sacks; for Eggs are depoſited by the oviparous Tribe in Sand, Weeds, or any other proper *Nidus*; nor could the Creatures by any means place Eggs in them, becauſe they open in a wrong Direction for ſuch a Purpoſe. But if they are viviparous, then the Young may probably be harbour'd in them, being capable of crawling into them, as we may ſee by the pectoral Webs on the under Side.

And to ſtrengthen this Conjecture, we may draw another Conſideration from the Manner of their Feeding; for theſe are Creatures of no ſwift Motion, and crawl on Bottoms of ſhoal Places, watching and alluring their Prey; now their Young cannot be ſuppoſed to have Power or Sagacity enough for this Work, till they are grown large and ſtrong, and have theſe Twigs in Perfection; therefore they muſt of Neceſſity be protected by the Parent, till they are able to provide for themſelves; which probably may be when they grow too large to enter into theſe *Marſupia*.

There are ſeven ſmall finny Webs like little indented Leaves, on each Side the under Jaw, and others of the ſame kind all round the Sides to the Tail.

He has a dorſal Fin near the Tail upon the Spine, and a ventral fleſhy Fin nearer the Tail than the former.

The five-finger'd Webs under the *Thorax* are rough and fleſhy, ſhewing their Buſineſs is to aſſiſt in ſlowly crawling from Place to Place; and there appears the Veſtige of the Spine from the Place of the Vent to the Tail on the moſt poſterior Part of the Belly.

Theſe are what I thought worthy your Notice, and hope they will have produced the Effect I deſigned; which was no more than to entertain you, by illuſtrating any ſingular Piece of natural Hiſtory, that may happen to fall in my Way; eſpecially in ſuch Subjects as do not often occur.

As to the Sex of the Fiſh, I could be no Judge of it, nor of any internal Part, as the *Viſcera* had been

taken out before I ſaw it, and all Appearances deſtroy'd that might inform us; and therefore we muſt refer the Reader to that curious Diſſection of it made by the learned Sir *George Ent*, as it is quoted by *Charleton*, in his *Mantiſſa Anatomica*.

References to the Figures.

Fig. I. is a back View of the *Rana piſcatrix*.

aa, the bony Ridges and Aſperities between the Eyes; from the central *Sulcus* of which ariſe
bbb, the three *Virgæ piſcatoriæ*, or Fiſhing rods.
cc, the *Cirruli*, or little Webs, all round the Borders of the Fiſh.
dd, the large humeral Fins, under which are the Openings into the *Marſupia* and *Branchiæ*.
ee, the two poſterior Rods.
f, the poſterior and ſuperior ſpinal Fin.
g, the Tail, which in this Fiſh is vertical.

Fig. II. A View of the under Surface or Belly of this Fiſh.

aa, the Angles of the lower Jaw, ſeen and felt through the Integuments.
b, the Skin or Floor of the Mouth capable of ſtretching into a Sack, according to the Bulk of the Prey he holds.
cc, the fleſhy five-finger'd Webs, by which they crawl upon the Bottoms of Shoals.
dd, the Openings into the *Marſupia* and *Branchiæ*.
e, the Vent or *Anus*.
f, the poſterior and inferior ſpinal Fin.
g, the cartilaginous *brancheoſtegal* Bones.

Fig.

Fig. III. is a View of the Mouth open'd to ſhew,

a, the Skin of the Floor of the Mouth, as at *b* in *Fig.* II.

b, the Tongue.

cc, the external Teeth in the upper and under Jaws, for holding the Prey.

dd, the correſponding Cluſters of Teeth in the inner cartilaginous Jaw, for Maſtication, and tearing the Prey.

ee, the *Rictus oris*. *f*, the upper Jaw. *g*, the Entrance into the *gulæ* and branchial Holes.

Fig. IV. is a full View of the Opening into the *Marſupium*, lying under the Fin *d*.

VIII. *Obſervations on the Height to which Rockets aſcend; by Mr.* Benjamin Robins *F. R. S.*

Read May 4. 1749.

THE Uſe of Rockets is, or may be, ſo conſiderable in determining the Poſition of diſtant Places to each other, and in giving Signals for naval or military Purpoſes, that I thought it worth while to examine what Height they uſually riſe to, the better to determine the Extent of the Country, through which they can be ſeen. I therefore, at the Exhibition of the late Fire-works, deſir'd a Friend of mine, who I knew intended to be only a diſtant Spectator, to obſerve the Angle of Elevation to which the greateſt Part of them roſe, and likewiſe the Angle made by the Rocket or Rockets, which ſhould riſe the higheſt of all.

My Friend was provided with an Inſtrument, whoſe *Radius* was 38 Inches; and, to avoid all Uncertainty in its Motion, it was fixed in an invariable Poſition; and its Field, which took in ten Degrees of Altitude was divided by horizontal Threads. The Station my Friend choſe was on the Top of Dr. *Nisbett's* Houſe in *Kingſtreet* near *Cheapſide*, where he had a a fair View of the upper Part of the Building erected in the *Green Park*. There he obſerved that the ſingle Rockets which roſe the moſt erect, were uſually elevated at their greateſt Height about $6°\frac{1}{4}$. above his Level; and that amongſt theſe there were 3 which roſe to $7°\frac{1}{2}$; and that in the laſt great Flight of Rockets, ſaid to be of 6000, the Creſt of the Arch, formed by their general Figure, was elevated about $8°\frac{1}{4}$. From the Care and Dexterity of my Friend, and the Nature of the Inſtrument, I doubt not but theſe Obſervations are true within a few Minutes.

The Diſtance of this Station from the Building in the *Green Park* is 4000 Yards, according to the laſt great Map of *London:* And hence it appears, that the cuſtomary Height, to which the ſingle, or honorary Rockets, as they are ſtyled, aſcended, was near 440 Yards: That three of theſe roſe 526 Yards; and that the greateſt Height of any of thoſe fired in the grand Girandole was about 615 Yards: All reckon'd above the Level of the Place of Obſervation, which I eſteem to be near 25 Yards higher than the *Green Park*, and little leſs than 15 Yards below the Cheſts whence the great Flight of Rockets was diſcharged.

It ſeems then there are Rockets which riſe 600 Yards from the Place whence they are diſcharged: And this being more than a third Part of a Mile, it follows,

follows, that if their Light be ſufficiently ſtrong, and the Air be not hazy, they may be ſeen in a level Country at above 50 Miles Diſtance.

The Obſervations on the ſingle Rockets are ſufficiently conſonant to ſome Experiments I made myſelf about a Fortnight ſince: For then I found that ſeveral ſingle Pound Rockets went to various Heights between 450 and 500 Yards, the Altitude of the higheſt being extremely near this laſt Number, and the Time of their Aſcent uſually ſhort of 7″.

But though from all theſe Trials it ſhould ſeem as if good Rockets of all Sizes had their Heights limited between 400 and 600 Yards; yet I am diſpoſed to believe, that they may be made to reach much greater Diſtances. This I in ſome degree collect from the Nature of their Compoſition, and the uſual imperfect Manner of forming them.

Nor is this merely Matter of Speculation; for I lately ſaw a dozen of four Pound Rockets fired; the greateſt Part of which took up near 14″ in their Aſcent, and were totally obſcured in a Cloud near 9 or 10″ of the Time; ſo that the Moment of their burſting was only obſervable by a ſudden Glimmering through the Clouds: And as theſe Rockets, during the Time they were viſible, were far from moving with a languid Motion, I cannot but conceive, that the extraordinary Time of their Aſcent muſt have been attended by a very unuſual Riſe.

IX. *Extract of ſo much of Don* Antonio De Ullöa's *F. R. S. Account of his Voyage to* South America, *as relates to the Diſtemper called there* Vomito Prieto, *or black Vomit. Tranſlated from the* Spaniſh *by* W. Watſon *F. R. S.*

Read May 4. 1749. THE City of *Cartagena* in *America* is ſituate in 10 Degrees, 25 Min. 48½ Seconds of North Latitude. The Weather there is always ſultry hot. A Thermometer conſtructed by Monſ. *de Reaumur* gave, on the 19th of *November* 1735. one of their Winter-Months, the Degree of the Warmth of the Air 1025 Diviſions and a half; and this with little Variation, both Night and Day. The greateſt Height to which the Spirit aſcended at *Paris* the ſame Year, by a Thermometer graduated in the ſame Manner, was 1025 and a half; half; ſo that the Heat of the cool Nights at *Cartagena* was nearly equal to that of the hotteſt Days at *Paris*.

As the Heats in this Climate are ſo great, without receiving any ſenſible Mitigation from the Nights, it is no Wonder that the Perſpiration of the Inhabitants is very great. From this it comes about, that all thoſe who make their Abode there any time, appear pale and weakly, as though newly recovering from a Fit of Illneſs. You remark in all their Actions, even ſo far as in ſpeaking, a certain Idleneſs, and, as our Author expreſſes himſelf, a Disjointedneſs: Notwithſtanding this they are in good Health, though their Aſpect indicates the contrary. The People who arrive there from *Europe*, hold the Appearance of Strength and Colour in their Countenances

nances during three or four Months; but after that time they loſe both one and the other from the Quantity of Sweat, until they become like the former Inhabitants. Theſe Effects are moſt obſervable in younger People; on the contrary, thoſe who are farther advanced in Life, when they go thither, preſerve their former Appearance better, and enjoy ſo good a State of Health, that they live commonly to more than eighty Years of Age.

As the Temperament of this Country is particular, ſo are ſome of its Diſtempers. Theſe may be conſider'd of two kinds; *viz.* thoſe Diſtempers to which the *Europeans* newly arrived there are liable, and *they* only; and thoſe which are common to all Perſons, as well *Criollos* as *Chapetones.*

The Diſtempers of the firſt Claſs are many, as the Reſort of the *Europeans* there is very great. They are very dangerous, and often mortal. They frequently deſtroy a great Part of the People, both Sailors and others, who arrive there from *Europe.* The Continuance of theſe Diſtempers is very ſhort; they laſt but three or four Days, in which time the Sick either die, or are out of Danger. The particular Diſtemper, to which they are moſt liable, is very little known; though it takes its Riſe in ſome from taking Cold, in others from Indigeſtion; but from whichſoever of theſe, or from what other Cauſe it takes its Riſe, it becomes in the ſhort time before-mention'd the *Vomito Prieto* or black Vomit, which is what kills them; it being very rare that thoſe, who have it, eſcape. It is obſerved in ſome, that their Delirium is ſo violent, that they are obliged to be tied down in their Beds, that they may not tear themſelves in Pieces; and they often die raving with the greateſt Degree of Agony.

It is to be remarked, that thoſe only are ſubject to this Diſtemper, who are lately arrived from *Europe:* The Inhabitants of the Country, as well as thoſe who have abided there any time, are by no means liable to it, and enjoy perfect Health during its greateſt Violence. As the Crews of Ships are very liable to this Diſtemper, and more ſo than the Officers and Paſſengers, who have greater Variety of Food and Liquor, it has been conceived, that the great Exerciſe and Labour of theſe People, and their feeding upon ſalt Proviſions, prepares their Conſtitutions to be liable in this Climate to a Corruption of the Blood and Humours, from whence is ſuppoſed to proceed the *Vomito Prieto.* What muſt be obſerved is, that although the Crews of Ships ſuffer the greateſt Slaughter, nevertheleſs Paſſengers and others, who go the Voyage under the greateſt Advantages, with regard to the Conveniences of Life, are not free from being expoſed to it. It muſt be remarked alſo, that thoſe Perſons, who, after having been uſed to this Climate, go from thence, and are abſent even three or four Years, are not liable to it at their Return, but retain their Health like the other Inhabitants; although in their Way of living they have not obſerved the moſt exact Regimen.

The Deſire of knowing the Cauſe of this terrible Calamity has occupied from time to time the Minds of the Surgeons who make this Voyage in the Galeons, as well as thoſe of the Phyſicians of the Country; and their Opinion has been, that it chiefly takes its Riſe from the Labour to which the Ships Crews are conſtantly expoſed, and their Manner of living. There is no doubt but theſe may greatly contribute thereto;

thereto; but then it will be difficult to conceive, why Perſons who are better circumſtanced are likewiſe liable to it: And it is ſomewhat extraordinary, that, notwithſtanding many Endeavours have been made towards finding out Remedies equal to this Diſeaſe, none have been diſcover'd, either as Specifics, or Preſervatives; for the Inconſtancy of the Symptoms is ſo great, that they are not in the Beginning to be diſtinguiſhed from thoſe which are in common to this with ſlighter Diſtempers; but the principal Complaints are at firſt a Wearineſs, and great Diſorder in the Head.

This Diſtemper does not always attack the Ships of *Europe* at their Arrival in the Bay of *Cartagena*; nor is it very ancient in that Country; for what heretofore was called *Chapetonada*, ſo denominated, as thoſe from *Europe* were only liable to it, were Indigeſtions: And though they were in that Climate always attended with Danger, the Women of the Country, as they do now, cured them with Eaſe, eſpecially when they are taken in time. The Ships afterwards going from *Cartagena* to *Porto Bello*, it was there ſucceeded with the great Mortality, which was always attributed to the Unſeaſonableneſs of the Climate, and to the Fatigue of the Ships Crews in unloading their Ships, and in the Buſineſs of the Fair there.

The black Vomit was not known at *Cartagena*, nor in its Neighbourhood, until the Years 1729 and 1730, when firſt it carried off a great Part of the Crews of the Ships of War, which Don *Domingo Juſtiniani* then commanded, and were then there as *Guarda Coſtas*. Theſe Ships were firſt attacked at

Santa Martha, where the Severity of this Diſtemper, and its great Slaughter, had caſt a great Terror upon their Crews. The ſecond Attack of this Diſtemper was on board the Galeons commanded by Don *Manuel Lopez Pintado*, when its Mortality was highly formidable, and Death follow'd the Attack ſo quick, that Perſons, who were one Day ſeen walking at large, were next Day met carrying to their Graves.

Our Author is of Opinion, that this, as well as ſome other Diſtempers to which *Europeans* are liable at firſt, or ſoon after their Arrival at *Cartagena*, and other Places under the ſame Circumſtances, ſhould be conſider'd as ariſing from the great Alteration that happens in their Conſtitutions there: And this Change, which from the Climate is ſoon brought about, makes them ſuffer this and other Diſtempers, which either deſtroy them, or generate in them a Diſpoſition to bear the Heats; after which, being as it were naturalized, they enjoy the ſame Share of Health with the Natives.

Our Author remarks, that at *Cartagena*, when the Ships from *Spain* fail in their Arrival, the *European* Productions, which at all times are dear, and much valued there, are ſometimes quite expended: Theſe more particularly are Wine, Oil, and Raiſins. When this is the Caſe with regard to Wine, the People there ſuffer much in their Health; as every body, except the Negroes, and thoſe who uſe Brandy, accuſtom themſelves to drink it with their Food. From the Want of this, their Stomachs fail, they grow ſick, and this Sickneſs becomes general. This Want of Wine happen'd when our Author arrived

at

at *Cartagena*, and the Sickneſs in conſequence was ſo general in that City, that Maſs was celebrated only in one of their Churches.

X. Declinationes quarumdam *Stellarum Auſtralium* primæ et ſecundæ magnitudinis, menſe *Junio* 1738. cum methodo inveniendi horam in mari noctu, ex aſpectu *Crucis auſtralis*; per Dn. *de la Condamine*, Reg. Societ. *Londin. & Acad. Reg. Scient. Pariſ. Socium.*

Read May 11. 1749. *Hæ declinationes erutæ ſunt ex variis obſervationibus habitis e quadrante tripedali, menſibus Junii annorum* 1737, 1738, *et ſequentium*, Quiti *in America in latitudine* 0° 13′ 16″ *auſtrali, in loco ſcilicet* 11 *minutis ſecundis magis ad auſtrum ſito, ac locus obſervationis ſolſtitiorum Dec.* 1736, *et Junii* 1737, *cujus latitudinem in commentariolo meo de diſtantia tropicorum obſervata jampridem ſtatueram.*

Notandum eſt præterea me in calculandis hiſce declinationibus uſum fuiſſe tabula refractionum Petri Bouguer *pro altitudine Soli Quitienſis quæ in commentariis Reg. Scient. Acad. pro anno* 1738 *inſerta eſt.*

	o	′	″
In navi *Argo* α *Canopus*. Stella primæ magnitudinis, et maxima fixarum uno Sirio excepto . . .	52	34	16

	°	′	″
Quæ in brachio præcedenti ſeu occidentali *Crucis Auſtralis* (*Bayero* γ) magnitudinis mediæ inter ſecundam et tertiam.	57	17	32
ζ in pede *Crucis* ſtella, quæ Polo auſtrali maxime vicina eſt e quatuor ſtellis quibus crux conſtat, teleſcopio viſa duplex apparet, nudo oculo ſimplex, et primæ magnitudinis	61	38	57
Quæ in vertice *Crucis* ε maxime *B* borealis ſecundæ magnitudinis, in brachio ſequenti ξ ſecundæ magnitudiuis . .	58	15	5
In pede *Centauri* præcedenti ſeu occidentali γ primæ magnitudinis . . .	59	5	35
In pede ſequenti *Centauri* α primæ magnitudinis	59	44	56

Jampridem *Panamæ* obſervantes menſe *Januario anni* 1736. animadverteramus repetitis vicibus addenda duo minuta prima circiter declinationi ſtellæ *Canopi* in *Catalogo Britannico*, ut latitudo loci ex obſervationibus prædictæ ſtellæ illata cum latitudine ex altitudinibus ſolis collecta conveniret; quæ quidem annotatio omnibus ſubſequentibus obſervationibus fuit confirmata, iiſque nominatim quibus innititur antecedens *Canopi* declinatio; e quibus colligitur major duobus minutis primis, et duobus ſecundis, ea, quæ ex catalogo *Britannico* eruitur.

Hæ omnes ſtellæ, de quibus ſupra, lucidiſſimæ ſunt, omniumque maxime ſpectabiles in hemiſphœrio auſtrali inter eas quæ in *Europa* non conſpiciuntur.

In

In pleriſque planiſphæriis varie repræſentatur Crux auſtralis, cujus ſitus, in his a Borea ad Auſtrum, in aliis ab *Euro-Borea* (N. E.) ad *Auſtro-Zephyrum* (S. O.) dirigitur. Carta cœleſtis partis cœli auſtralis *Ignatii Pardies* ſchema Crucis auſtralis exhibet duplex, unum ſcilicet in illa, alterum in hac directione, quarum prior vera eſt.

Crux itaque auſtralis, cum in meridiano verſatur, recta apparet, id eſt, horizonti perpendicularis, ideoque abſque errore ſenſibili nautis inſervire poteſt ad horam inveniendam, cognita differentia temporis inter tranſitum ipſius per meridianum ac ſolis, methodo ſequenti ad praxim nautis facilem accommodata.

Ex repetitis obſervationibus ad annum præſentem 1749. redactis, colligo, quatuor minuta prima cum dimidio circiter intereſſe inter mediationem ſtellarum ζ et ε in pede et capite Crucis auſtralis, prioremque appellere ad meridianum minutis fere 13, poſtquam in boreali hemiſphærio culminavit primum arietis punctum. Ex tabula igitur mediationis primi puncti arietis, qualem exhibet libellus qui ſingulis annis prodit in lucem ſub titulo *Notitia Temporum* (*Connoiſſance des Tems*) hora vera noctu in mari facillime obtinebitur ex aſpectu Crucis auſtralis, attendendo qua hora Crux videbitur recta, et horizonti perpendicularis, ſeu potius, quando per tempus licuerit, filo, vel funiculo, appenſo, pondere verticaliter tenſo, et ex manu ſuſpenſo, obſervando illud momentum quo ſtellæ ζ in pede, et α in capite *Crucis auſtralis* hinc et hinc a perpendiculo æqualiter diſtare videbuntur. Hæc ex parte orientali, illa ex occidentali; nempe quo temporis puncto hæc fili poſitio obtinebit, vix uno minuto errabit in hora vera, addendo 15 minuta primæ,

prima, horæ mediationis primi puncti arietis, quæ ex prædicta tabula, emendata meridianorum calculatoris et obſervatoris differentia, concludetur.

Stella ζ in pede Crucis ideo maxima inter quatuor apparet, quod nudo oculo viſa coaleſcit cum altera exigua, quæ quatuor aut quinque minutis ſecundis poſt illam appellit ad meridianum, quæque teleſcopio obſervato auſtralior eſt minuto cum 31 ſecundis; diſtantia micrometro menſurata.

Pes ſequens ſive orientalior *Centauri* α ſtella primæ quoque magnitudinis, quæ capellam videtur æmulari, imo fulgore et magnitudine ſuperare, etiam duplex eſt, conſtatque duabus ſtellis, quarum minor e majoris ſinu emergere vix notatur optimo telescopio tripedali. Hæc etiam illa borealior eſt, ac paulo auſtralior.

Ludovicus Feuilleus, qui unam et alteram teleſcopio 18 pedum obſervavit, majorem tertiæ, minorem quartæ magnitudinis ſtatuit, quod propriis obſervationibus confirmare mihi non licuit; ſed perperam idem auctor pedem *Centauri* in quo hæ duæ ſtellæ unitæ conſpiciuntur, Borealem nuncupat. Obſervata ab ipſo *Feuilleo* anno 1710. die *Feb.* 26, in civitate *Conceptionis Chileenſis* ejuſdem ſtellæ declinatione, quam 39 minutis majorem alterius pedis declinatione ſtatuit.

XI.

XI. *A Letter from Mr.* Emanuel da Coſta *F. R. S. to the* Preſident, *concerning two beautiful* Echinites.

SIR,

Read May 11. 1749. I HAVE the Honour of laying before you (in order to communicate to the *Royal Society*, if you think it worthy) the Deſcription of two *Echinites*, or Stones moulded in foſſil *Echini* Shells, hitherto undeſcribed, as far as I know.

Theſe *Echinites* are undoubtedly moulded in Shells, of a *Genus* of which we at preſent find ſome Species now living in the Seas; moſtly in the *Weſt Indies*. The *Echinometra* of *Ariſtotle*, *Aldrovand*, and of Dr. *Grew* (*a*), is of this *Genus*. Dr. *Breynius* (*b*) calls the whole *Genus Echinanthus*; and Mr. *Klein* (*c*) *Scutum*. *Woodward* (*d*) in his Diſtribution of foſſil *Echini* calls them the *Pentaphylloides*, from the Rays on the upper Part forming a beautiful cinquefoil Figure; but wrongly fixes their Characteriſtics in having only one Aperture, and that at the Baſis; in which he not only contradicts Nature, but alſo the very Specimens he quotes in his own Collection, which have all two *Foramens* or Apertures, and are elegantly figured ſo by *Agoſtino Scilla* (*e*) who was the Perſon that ſent them to the Doctor; and

(*a*) *Muſeum Reg. Soc.* p. 139. (*b*) *Schediaſma de Echinis*, p. 60. (*c*) *Nat. Diſp. Echinodermatum*, p. 20, TAB. 17. *A*, et TAB. 18, *B*. (*d*) *Cade* of foreign extraneous Foſſils, *p.* 16. (*e*) *La vana Speculazione diſingannata dal ſenſo*, TAB. 9, 10, and 11.

and our late Preſident Sir *Hans Sloane* (*f*) has alſo figured and deſcribed two Species of this *Genus*, whereof one Species is an Inhabitant of our *Engliſh* Seas.

I obſerved above, that, to my Knowledge, no Author has ever deſcribed *Echinites* or Stones moulded in the foſſil *Echini* of this *Genus*; nor even have the foſſil *Echini* or Shells themſelves been ever exhibited by any Lithologiſt, except by the above-quoted *A. Scilla*, who ſent them to Dr. *Woodward*, and found them in *Malta*; to which the Doctor in his Catalogue recounts two other Specimens, which were dug up in *Maryland*; ſo rare are the Inſtances of the Foſſils of this whole *Genus!*

The two *Echinites* here deſcribed (as alſo ſome few other Specimens of this ſort, which I hear are in ſome Cabinets in this Metropolis) were all found in the midſt of ſome Rocks, which were blown up at *Port Mahon* ſome Years ago, and from whence they were all brought.

The firſt or largeſt is in the Poſſeſſion of the Right Rev. Dr. *Lavington*, Lord Biſhop of *Exeter*: it is compoſed of a hard or ſtony arenaceous greyiſh Subſtance, and is of an Eſcutcheon or Heart-like Shape: It meaſures about $14\frac{1}{2}$ Inches in Circumference, or quite round the Limb or Edge, about two Inches high from the Flat or Baſis to the Tip of the *Apex*, five Inches in Length at the Baſis, and $4\frac{1}{4}$ in Breadth. On the upper Part it riſes nearly gradually from the Edge quite to the *Apex*. A central Point, with a ſlight declining Space, tops the ſaid *Apex*; from which Space

(*f*) *Nat. Hiſt.* of *Jamaica*, Vol. 2. Tab. 242, *Fig.* 3. *et ſeq.*

Space the Body regularly divides into five Parts figured like Leaves to the Edge. Theſe Leaves are narrow at the *Apex*, greatly widen toward the Bottom, and narrow a little again at their End. Each Diviſion or Leaf is bounded on each Side by a Row of parallel Ridges, which are accompanied alſo on each Side of every ſaid Row, with two other Ranges of Points or Knobs; all which Rows do not meet or cloſe together at the lower End of the Diviſion, but leave a void unwrought Space: A Row of larger irregular Knobs runs through the midſt of each Leaf. From the Diviſions between each Leaf runs a rugged knobb'd Pillar, which is join'd to the Edge: The other Parts between the Leaves and the Edge are Hollows, or void Spaces. The Edge or *Limbus* is of a thick cylindric Make, runs quite round the whole Body, and only has ſome Signs of being disjoined at the one Extreme of the Length, or where the Aperture was; the Stone anſwering which is here extended a little cylindrically outward like an Appendage, and was ſo formed by the ſtony Matter being too much in Quantity for the Shell, and ſo was protruded through the ſaid *Foramen*. On the outer Edge of the *Limbus* are ſome few irregular ſtony Concretions. The Baſis is flat, and is likewiſe divided into five Parts from the Center, which is one of the *Foramens*; the other *Foramen* (as has been above deſcribed) being placed at one of the Extremes of the Length. This *Foramen* or Center is about the Size of a Shilling. The five Diviſions extend to the utmoſt Edge of the Body, or quite over the *Limbus*, contrary to the Diviſions on the upper Part, which extend only to it. Each Diviſion is formed by a ſtony Line edged on each Side with ſtony cylindrical

Bodies of the Thickneſs of a Pin, but of different Lengths, ſo as to appear like the Teeth of a Comb, or the Gills of a Fiſh; the Interſtices between all which is a rugged ſtony Work, and Hollows pervading quite through the Body to the upper Part.

I cannot but think theſe five pectinated Diviſions on the Baſis owe their Figure to ſome Parts of the included Fiſh; which I am more confirmed in, as I have ſeen ſome Specimens of the common pileated and galeated *Echinites*, which have been hollow'd at their *Apex*, and mark'd ſtar-wiſe; that Concavity, and the ſtellar Mark proceeding from the Interpoſition of the Fiſh between the ſtony Matter then filling the Shell, and the Top of the Shell itſelf.

The other *Echinite* I have the Honour of producing before the *Society*, belongs to Mr. *Edward Jacobs* of *Feverſham*. It is of a different Species, though of the ſame *Genus*, of a heart-like Shape, and about one third the Size of the above-deſcribed. This is greatly copped, the *Apex* lying very high, and the five Diviſions running near perpendicularly down to the Edge. The upper Part of this is elegantly perfect; the Work is near the ſame as on the other; only that, by the Perfection this preſerved is in, we obſerve that the Rows of parallel Ridges, which adorn each Side of each Leaf or Diviſion, riſe into a kind of arch'd Work or Bridge, made up of arch'd cylindrical Bodies, through which the middle Row runs, joined or connected in a long ſtrait cylindrical Stem, in a moſt curious and elegant manner. The Baſis or under Part of this Specimen is very imperfect, and only ſeems to differ in the Center being greatly excavated or concave, anſwering to the great Copping

Copping or Height of the *Apex* or upper Part. This Foſſil alſo conſiſts of a hard ſtony arenaceous Subſtance like the other.

From the Inſpection of the ſeveral Hollows of theſe *Echinites*, it is evident they were not immediately moulded in the Shells, but were form'd in Cavities which thoſe Shells formerly filled in the Rocks they were lodged in. The Rocks were apparently of a looſened arenaceous Texture, and the Water *&c.* continually pervading them, rotted and deſtroy'd the incloſed Shells, and bore away their whole Subſtance. In the ſame manner, and by the ſame means, were the ſtony Particles replaced into thoſe very Cavities which the Shells formerly filled; conſequently theſe Bodies were moulded exactly to the ſaid Cavities.

This Remark carries a Concluſion with it, if Obſervation be made, that the Hollows and ſolid Parts of theſe Stones exactly anſwer to the Hollows and ſolid Parts of the very Shells themſelves; which, had they been moulded in the very Shells, muſt have happen'd directly contrary; the ſolid Parts of the Shells forming Hollows in the Stone, and *vice verſa*. In all ſandy or lax earthy Matter foſſil Shells are very ſeldom found, but only the moulded Stones; the looſe Texture of thoſe Subſtances giving free Acceſs to Water, Vapours, and mineral Exhalations, *&c.* which intirely corrode and deſtroy the Shells buried in it.

I have taken the Liberty to produce before the *Society* a recent *Echinus* of this *Genus* from the *Weſt Indies*, to elucidate my Subject; as alſo two Drawings done by Mr. *Mynde*; *viz.* of the Baſis of

the large *Echinite*, and the upper Part of the ſmall *Echinite*: All which are ingraved in TAB. IV. I am, with Reſpect,

SIR,

London, April 27, 1749.

Your very devoted, and obliged humble Servant,

Emanuel Mendes da Coſta.

References to the Figures.

See TAB. IV.

Fig. 1. A View of the upper Part of a curious *Echinite*, in the Poſſeſſion of Mr. *Edward Jacobs*, of *Feverſham* in *Kent*.

Fig. 2, A View of the under Side of the ſame *Echinite*.

Fig. 3. A View of the under Side of a curious large *Echinite*, in the Poſſeſſion of the Right Rev. Dr. *George Lavington*, Biſhop of *Exeter*.

N. B. The upper Part of this Echinite having nothing remarkably particular or different, it was not judged neceſſary to give a Figure of it.

XII.

XII. *The State of the* Tides *in* Orkney; *by Mr.* Murdoch Mackenzie.

Read May 25. 1749. NO Accounts of the Flux and Reflux of the Sea were ſatisfactory, till Sir *Iſaac Newton*'s penetrating Genius deduced their true Cauſe from the Laws of Gravitation. His Principles carried ſuch Conviction along with them, and gave ſuch an eaſy Solution of ſome of the moſt remarkable *Phænomena*, that Mankind ſeemed to imagine a thorough Knowledge of the Tides might be obtained from an attentive Conſideration of the Principles he had eſtabliſhed, without the Trouble of further Obſervations; but, as he, and all Philoſophers ſince his Time, have conſider'd only, or principally, the Influence of the Moon in elevating or depreſſing the Tides; their ſeveral Directions, Velocities, and other Affections, reſulting from the Influence of Land, Shoals, and Winds, remain ſtill as inexplicable, and as little known as ever.

As a diſtinct Knowledge of theſe Things is not only conducive to the Advancement of Science, but would greatly contribute to a convenient and ſafe Navigation, it may not be unacceptable to communicate ſuch Remarks on the Tides about the *Orkney* Iſlands, as came under my Obſervation, while I was employed in ſurveying and navigating that and other adjacent Places; hoping it may incite others to explore the various Motions of that Element, on which ſuch a conſiderable Part of the World are daily employed, in a more extenſive and accurate manner than has yet been done.

From

From ſome Obſervations on the Tides in *Orkney*, I incline to think the Water begins to riſe and fall ſooner near the Shore than at a Diſtance from it.

When Spring-Tide is at its greateſt Altitude, or Depreſſion, the Water continues in a quieſcent State near half an Hour: Neap-Tides continue ſo about an Hour and a half.

The Motion of the Water, both in Aſcent, Deſcent, and Progreſſion, is accelerated from the firſt to the fourth Hour, commonly; from the fourth to the laſt Hour its Velocity diminiſhes. This, however, admits of ſome Variation from the Influence of Winds.

The greateſt Spring-Tides, and leaſt Neap-Tides, are commonly on the third or fourth Day, after the Syzygies and Quadratures; but in this alſo the Winds have a conſiderable Influence; Weſt and South-weſt Winds making the greateſt Floods, and leaſt Ebbs; North and North-eaſt Winds, on the contrary, making the greateſt Ebbs and leaſt Floods in *Orkney*, and on the North Coaſt of *Scotland*. When Flood Tide is raiſed higher than ordinary by Winds, the ſubſequent Ebb is not ſo low as it would have otherwiſe been. When a high Flood is raiſed by the Moon, the ſucceeding Ebb is proportionally low.

Ordinary Spring Tides riſe 8 Feet perpendicular, ordinary Neap Tides $3\frac{1}{2}$; extraordinary high Spring-Tides riſe 14 Feet; extraordinary low, only 5; extraordinary high Neap-Tides riſe above 6 Feet; extraordinary ſmall Neap-Tides not above 2. Low-water Neap Tide, at a mean, I judge is about 3 Feet above Low-water Spring-Tide, and High-water Spring-Tide about 3 Feet above High-water Neap-Tide: Yet the

Riſe

Riſe and Fall vary ſo much, that it would require a longer Courſe of Obſervations than I have had Opportunity of making, to determine what is moſt frequent in this Caſe.

When a Stream of Tide is interrupted by Land, or Rocks, or is confined within a Chanel, or long Arm of the Sea growing uniformly narrower, the Water will riſe higher there than in neighbouring Places, where it is not ſo affected. If the Chanel, or Arm of the Sea, has ſeveral Windings, or Reaches, as they are called in the *Thames*, the ſuperior Elevation will not be ſo conſiderable.

The following Obſervations of the Riſing and Falling of the Water, were made in the Day-time, in the Bay of *Kirkwall*, *anno* 1748.

Auguſt 8. Wind W. a Breeze.
Laſt Quarter 4th Day.
Moon's Apogee diſtant 24°.
Moon's Declination 27° N.
Moon bearing at firſt W. by N.

		Feet	Inch.
The Water roſe	1*ſt* Hour	0	½
	2*d*	0	2
	3*d*	0	4½
	4*th*	0	9½
	5*th*	0	5½
	6*th* and to the End	0	5½
	In all	2	5

Auguſt

Auguſt 15, Wind ENE. ſmall Breeze.
New Moon 3d Day.
Moon's apparent Diſtance 65°.
Moon's Declination 7° S.
Moon bearing SSE.

		Feet	Inch.
The Water fell	1ſt Hour	0	1½
	2d	0	4½
	3d	1	4
	4th	1	8
	5th	1	5
	6th	0	10
	In all	5	9

Auguſt 23, Wind W. almoſt calm.
Firſt Quarter, 3d Day.
Moon's Perigee diſtant 13°.
Moon's Declination 25° S.
Moon bearing E by N.

		Feet	Inch.
The Water roſe	1ſt Hour	0	6
	2d	1	0
	3d	1	8
	4th	1	0
	5th	0	8
	6th	0	7
	In all	5	9

Aug. 29, Wind S*b*W. Breeze at firſt, afterwards calm.
Full Moon 3d Day.
Moon's Perigee Diſt. 68°.

Moon's

Moon's Declination 6° N.
Moon bearing N N W.

		Feet	Inch.
The Water fell	1ſt Hour	1	0
	2d	0	10
	3d	1	4
	4th	1	2
	5th	2	10
	6th	1	0
	In all	8	5

Aug. 27, Wind W S W. a ſmall Breeze, the Day of Full Moon, Moon's Perigee Diſtance 36°, Decl. 4° S. bearing N N W. the Water fell in all 8 Feet 4 Inches perpendicular.

Aug. 30, calm, 4th Day after Full Moon, Perigee Diſtance 80°, Decl. 13° N. Moon bearing N *b* W. the Water roſe 8 Feet 3 Inches.

Sept. 3, Wind S W. a ſmall Breeze, firſt Day of the laſt Quarter, Apogee Diſt. 50°. Decl. 27° N. Moon bearing W. the Water roſe 6 Feet 1 Inch.

Sept. 6, Wind E. a ſmall Breeze, 4th Day of the laſt Quarter, Apogee Diſt. 15° Decl. 21° N. Moon bearing W. the Water roſe 3 Feet 9 Inches.

Sept. 15, Wind S. a moderate Breeze, 5th Day after New Moon, Perigee Diſt. 80°. Decl. 24° S. Moon bearing S *by* E. the Water fell 5 Feet 9 Inches.

To aſcertain all the Varieties in the riſing and falling of the Water, the Obſervations ought to have been continued much longer, the Night-Tides as well as Day-Tides obſerved; alſo the exact Times of

the Beginning and Ending of each, the Strength of the Wind and Weight of the Atmoſphere by a Barometer.

The foregoing Articles relate to the Riſing and Falling of the Water; the following to the various Motions of the Stream, and their Conſequences.

On the Coaſt of *Orkney*, and *Fair* Iſle of *Shetland*, the Body of the Flood comes from the North-weſt; on the Eaſt and Weſt Coaſts of *Lewis*, one of the Weſtern Iſles of *Scotland*, it comes from the South.

A League or two off the Coaſt, the Strength of the Stream is ſcarce ſenſible, except when it is confined by Land, or near Rocks or Shoals.

When the Tide begins to riſe or fall on the Shore, about that ſame time the Stream near the Shore begins to turn or reverſe its Direction, a few Irregularities excepted.

The Stream of Tide changes its Direction ſooner near Land than at a Diſtance from it; inſomuch that, in a Place two or three Miles from Land, the Turning of the Tide is two Hours, or more, later than on the adjacent Shore: At intermediate Diſtances the Streams turns at intermediate times. Hence a Veſſel may find a favourable Tide near Land, while it would be againſt her a Mile or two from it; and the contrary.

During the Continuance of Flood, the Stream varies its Direction gradually from the Eaſt toward the South, and the Stream of Ebb from the Weſt towards the North: That is, if the Stream, when it becomes firſt ſenſible, runs Eaſt, at the latter End of the

the Tide it will run South, if the Proximity of Land or Shoals does not hinder this Change of Direction.

The greateſt Velocity of Spring Tide in *Orkney*, in the Chanels where it runs quickeſt, is about 9 Miles an Hour: The greateſt Velocity of Neap-Tide is about one third or fourth of Spring-Tide. The Tides are moſt rapid commonly between the third and fourth Hour. Spring-Tides acquire a conſiderable Degree of Strength in leſs than one Hour after their quieſcent State begins; Neap-Tides are hardly ſenſible in two Hours after.

In ſimilar Streights or Chanels, lying in the ſame Direction, and ſupplied from the ſame Part of the Ocean, the Velocity of the Streams will be in the direct *Ratio* of the Breadth of the Inlets, and the Inverſe of the Outlets.

If a Sound, or Streight between two Iſlands, or Continents, lies in the Direction of the main Body of the Tide, the Velocity of the Stream in that Streight will be greater (all other things alike) than in any other adjacent one, not lying in that ſame Direction.

If an Iſland lies directly in the Tide-way, the Stream will divide, or ſplit, before it reaches the Iſland, into two Branches, one of which will run toward one Side or End of the Iſland, and the other toward the other End of it; and, in paſſing by, will be reflected a little from the Land. Hence a Veſſel, in a Calm, carried along with a ſtrong Stream of Tide, is in no Danger of touching an Iſland, or viſible Rock, if the Water is deep enough near them.

If the Tide runs ſtronger, or more obliquely, by one End of an Iſland than the other, from the ſtrongeſt Stream, and from the moſt oblique, there will be a

languid Current toward the other; that is, the Tide, along that Side of the Iſland, will ſet longer one Way than the other.

If a ſtrong Stream of Tide runs acroſs the Mouth of a Bay that does not reach far into the Land; within that Bay there will be a ſlow Stream ſetting the contrary Way. Or, if a ſtrong Stream ſets directly, or nearly ſo, along the Extremity of a Point, or Promontory, that ſtretches ſtrait out from the Coaſt, between this Stream (before it reaches the Point) and the Coaſt, there will be a languid Current with a contrary Direction. By attending to this, one Veſſel may keep her Courſe, or gain a Port, while another is carried away with the Tide.

If a ſmall Iſland lies thwart a Tide-way, that Part of the Stream which runs along one End of it, will join what runs along the other, at ſome Diſtance beyond the Iſland, incloſing between them a curved Space, within which there will either be no ſenſible Current, or a ſlow one, contrary to the other Streams. The counter Current, in the middle of this almoſt ſtagnant Space, or Eddy, when it gets near the Iſland, ſplits in two; one Branch of which runs towards one Extremity of the Iſland, the other towards its other Extremity; where meeting the ſtronger direct Streams that form the Eddy, are by them again carried towards its *Vertex*.

Theſe Eddies may be of great Service to Ships or Boats, by ſheltering them from a rapid Stream, or even carrying them againſt it; or may enable them to croſs it with more Advantage, according to the different Places to which they are bound. The Oppoſition of the contrary Tides bounding

bounding the Eddy, makes that Part of the Sea rougher in blowing Weather, and of a darker Colour in Calms, than the reſt, by which the Limits and Direction of theſe Eddies are always diſtinguiſhed.

The Colliſion of the oppoſite and oblique Streams, near the Ends of the Iſland, will excite a circular Motion in the Water, and, if the Celerity of the Tide is conſiderable, will occaſion Whirlpools, or Cavities in the Sea, in Form of an inverted Bell, wide at the Mouth, or at the Surface of the Sea, and growing gradually narrower toward the Bottom: Their Width and Depth are in proportion to the Rapidity of the Streams that cauſe them, and are ſometimes ſo large as to be dangerous. Thoſe in *Petland Firth*, near the Iſlands *Stroma* and *Swona*, may, with Spring-Tide, turn any Veſſel quite round, but are never ſo large as to endanger one otherways: There have been Inſtances, however, of ſmall Boats dropping into, and being ſwallowed up by them. The *Hiatus*, or Cavity, is largeſt when it is firſt formed, and is carried along with the Stream, diminiſhing gradually in Dimenſions as it goes, until it quite diſappears. The Suction, or ſpiral Motion communicated to the Water, does not ſeem to extend far beyond the *Hiatus*. I paſſed, in a Boat, within 20 Yards of one, without being ſenſible of any Attraction; but indeed it was toward the latter End of the Tide, when its Strength was much abated: The Diameter of the Cavity, at that time, I judged to be between two and three Feet. When Fiſhermen are aware of their Approach toward a Whirlpool, or Well, as it is called in *Orkney*, and have Time to throw an Oar, or any other bulky Body into it before they

are

are too near, the ſpiral Motion is interrupted, and the Continuity of the Water broke; which, ruſhing in on all Sides, immediately fills up the Cavity, and enables them to go over it ſafe. Hence in blowing Weather, or when there is a breaking Sea, tho' there may be a circular Motion in the Water, there can be no Cavity.

When there is a ſteep ſunk Rock near the Concourſe of ſuch ſtrong Tides, and not very deep below the Surface, a moſt amazing *Phænomenon* will happen: For, the Stream being interrupted in its Courſe, and falling ſuddenly over the Rock, is reflected from the Bottom upwards, ſwelling and bubbling on the Surface like boiling Water, and carrying Sand, Shells, Fiſhes, or other looſe Bodies along with it; which, with Boats, or whatever elſe is near, are driven with great Force from the Center all around toward the Circumference, upon which, a Gyration of the Water enſuing, a Whirlpool begins, which is carried along with the Stream, as was ſaid above, leſſening gradually till it is quite extinguiſhed: In a little time a new Eruption and Ebullition, like the former, begins, which proceeds in the ſame manner, till the Swiftneſs of the Stream abates, or the Tide riſes or falls too much above the Rock.

Queries concerning the Tides in a large Ocean; which, if reſolved from Obſervation, would render the Theory more perfect.

1. Since the Attraction of the Moon raiſes the Water directly below her, by diminiſhing its Gravity toward the Earth's Center, and, at that very ſame

ſame time, depreſſes it at a Quadrant's Diſtance, by augmenting the Gravity there, ſo that the ſuperior Altitude of one Part of the Ocean is immediately balanced by the ſuperior Gravitation of another; do not, therefore, the Tides in the Ocean riſe and fall without any progreſſive Motion, or ſenſible Velocity? And do not all Currents, or Streams of Tide (not cauſed by Winds) proceed from the Interruption which Land, or Shoals, give to the undulatory Motion which muſt accompany the perpendicular Aſcent or Deſcent of the Fluids?

2. Is it agreeable to Obſervation, that the Power of the Sun and Moon together, raiſes the Tides within the Tropics about 14 Feet, as *Newton*, *Halley*, and *Maclaurin* ſuppoſe? And how high are the Tides found to riſe in Parts of the Ocean of a greater Latitude? If the Water does not riſe and fall ſo much within the Tropics, as in Places more diſtant from the Equator, what hinders the greater Power to have a greater Effect? For the Moon muſt act with greateſt Force on thoſe Parts to which ſhe is vertical.

3. If the Times of high and low Water depend on the Moon's Appulſe to the Meridian, is it not high or low Water in all Parts of the Ocean, under the ſame Meridian, about the ſame time? And is the Difference of the Times, in Places under different Meridians, in any certain Proportion to their Difference of Longitude?

4. Since the Power of the Moon to raiſe the Tide in any Place is greateſt when ſhe is neareſt the Zenith, it is agreeable both to Obſervation and Theory, that the Water riſes and falls more when ſhe is above, than when below the Horizons of Places on the ſame

Side

Side of the Equator with her; and the contrary: Are not the Tides alſo of longer Duration in that Caſe? Since a greater Portion of the Hemiſpheroid, into which the Sea is formed by the Moon's Attraction, is then above the Horizons of theſe Places, than is below them. If this is found to be Fact, it will alſo be found, that the Duration in different Places (other things alike) will be in ſome meaſure proportional to their Latitudes, and the Declination of the Moon.

5. In an oblique Sphere, all Azimuth Circles cut the Equator and its Parallels obliquely; and therefore the Moon muſt come ſooner to, or from, a given Azimuth, with one Declination than with another. In ſome Latitudes this Difference will amount to ſeveral Hours. Is it not then a falſe Rule to judge of the Times of high or low Water by the Moon's Azimuth, or to ſignify one by the other, as is the Cuſtom of Sailors?

XIII. *Some Account of the Remains of* John Tradeſcant's *Garden at* Lambeth; *by Mr.* W. Watſon *F. R. S.*

Read May 25. 1749.

UPON a Viſit made to Mr. *John Tradeſcant*'s Garden at *South Lambeth*, *May* 21, 1749. by Dr. *Mitchell* and myſelf, were obſerved the under-mention'd exotic Plants.

This Garden was planted by the above-mention'd Gentleman about an hundred and twenty Years ſince, and was, except that of Mr. *John Gerard*, the Author of

of the Herbal, probably the firſt botanical Garden in *England*. The Founder, after many Years ſpent in the Service of the Lord Treaſurer *Salisbury*, Lord *Wotton*, &c. travell'd ſeveral Years, and procured a great Variety of Plants and Seeds before not known in *England*; to ſeveral of which at this time the Gardeners give his Name, as a Mark of Diſtinction; as *Tradeſcant*'s Spiderwort, *Tradeſcant*'s Aſter, *Tradeſcant*'s Daffodil. He firſt planted here the *Cupreſſus Americanus Acaciæ foliis deciduis*, which has been ſince ſo much eſteem'd, and is now one of the great Ornaments of the Duke of *Argyll*'s Garden at *Witton*.

Mr. *Tradeſcant*'s Garden has now been many Years totally neglected, and the Houſe belonging to it empty and ruin'd; and though the Garden is quite cover'd with Weeds, there remain among them manifeſt Footſteps of its Founder. We found there the *Borrago latifolia ſempervirens* of *C. B.* *Polygonatum vulgare latifolium C. B.* *Ariſtolochia clematitis recta C. B.* and *Dracontium Dod.* There are yet remaining two Trees of the *Arbutus*, the largeſt I have ſeen; which, from their being ſo long uſed to our Winters, did not ſuffer by the ſevere Colds of 1729 and 1740, when moſt of their kind were kill'd throughout *England*. In the Orchard there is a Tree of the *Rhamnus catharticus*, about 20 Feet high, and near a Foot in Diameter, by much the greateſt I ever ſaw.

It is not unlikely but there may be ſeveral other Plants yet remaining in the Garden, but flouriſhing at a different Time of the Year.

W. Watſon.

XIV. *A Letter from the Rev. Mr.* Richard Dunthorne *to the Reverend Mr.* Richard Maſon *F. R. S. and Keeper of the* Woodwardian Muſeum *at* Cambridge, *concerning the* Acceleration *of the* Moon.

SIR, *Cambridge, Feb.* 28, 1748-9.

Read June 1. 1749. AFTER I had compared a good Number of modern Obſervations made in different Situations of the Moon and of her Orbit in reſpect of the Sun, with the *Newtonian* Theory, as in my Letter of *Nov.* 4, 1746;† I proceeded to examine the mean Motion of the Moon, of her Apogee, and Nodes, to ſee whether they were well repreſented by the Tables for any conſiderable Number of Years, and whether I ſhould be able to make out that Acceleration of the Moon's Motion which Dr. *Halley* ſuſpected. *Vide* Phil. Tranſ. *n.* 218.

To this End I compared ſeveral Eclipſes of the Moon obſerved by *Tycho Brahe*, as they are ſet down in his *Progymnaſmata*, *p.* 114, with the Tables *, and found them agree full as well as could be expected; conſidering the Imperfection of his Clocks, and the Difficulty there muſt commonly have been in determining the Middle of the Eclipſe from the Facts obſerved, as publiſhed in his *Hiſtoria Cœleſtis*. Indeed the ſmall Diſtance of Time between *Tycho Brahe* and

† See theſe Tranſact. No. 482. p. 412.

* My Tables corrected as in my former Letter; which is always to be underſtood of the Tables mention'd in this.

and *Flamſteed* render'd *Tycho*'s Obſervations but of little Uſe in this Enquiry.

The next Obſervations that occurred to me were thoſe of *Bernard Walther* and *Regiomontanus*, which being at double the Diſtance of Time from *Flamſteed* that *Tycho*'s were, ſeemed to promiſe ſome Aſſiſtance in this Matter: Upon comparing ſuch of their Eclipſes of the Moon whoſe Circumſtances are beſt related with the Tables, I found the computed Places of the Moon were moſtly 5′ too forward, and in ſome conſiderably more, which I could hardly perſuade myſelf to throw upon the Errors of Obſervation; but concluded, that the Moon's mean Motion ſince that time, muſt have been ſomething ſwifter than the Tables repreſent it; though the Diſagreement of the Obſervations between themſelves is too great to infer any thing from them with Certainty in ſo nice an Affair.

Then I compared the four well-known Eclipſes obſerved by *Albategnius* with the Tables, and found the computed Places of the Moon in three of them conſiderably too forward: This, if I could have depended upon the Longitude of *Aracta*, would very much have confirmed me in the Opinion, that the Moon's mean Motion muſt have been ſwifter in ſome of the laſt Centuries than the Tables make it; though the Differences between theſe Obſervations, and the Tables, are not uniform enough to be taken for a certain Proof thereof.

I could meet with no Obſervations of Eclipſes to be at all depended upon between thoſe of *Regiomontanus* and *Albategnius*, except two of the Sun and one of the Moon made at *Cairo* in *Egypt*,

related in the *Prolegomena* to *Tycho Brahe's Hiſtoria Cœleſtis*, *p.* 34; nor any between thoſe of *Albategnius* and *Ptolemy*, beſides the Eclipſe of the Sun obſerved by *Theon* at *Alexandria*; notwithſtanding I carefully ſearched all the Remains of Antiquity I could find with that View. Theſe Eclipſes of the Sun are the more valuable, becauſe they were obſerved in Places the Longitudes and Latitudes whereof are determined by Monſieur *Chazelles* of the *Royal Academy* of *Sciences*, who was ſent by the *French* King in the Year 1693, with proper Inſtruments for that Purpoſe. *Du Hamel Hiſt. Acad. p.* 309, 395.

The ſolar Eclipſe obſerved by *Theon* was in the 112th Year of *Nabonaſſar* the Day of *Thoth*, according to the *Egyptians*, but the 22d Day of *Pauni*, according to the *Alexandrians:* He carefully obſerved the Beginning of 2 temporal Hours and 50′ Afternoon, and the End at 4½ Hours nearly Afternoon at *Alexandria*. *Theonis Comment. in Ptol. mag. Conſtruct. p.* 332. This Eclipſe was *June* 16, in the Year of Chriſt 364: And the temporal Hour at *Alexandria* being at that time to the equinoctial Hour as 7 to 6, makes the Beginning at 3 equinoctial Hours and 18′ Afternoon, and the End at 5 equinoctial Hours 15′ nearly.

The Eclipſes obſerved at *Grand Cairo* were as follows.

" Anno Hegiræ 367, die *Jovis*, qui erat 28, rabie
" poſterioris (is eſt ordine menſis quartus, et incipit
" ille annus *Saracenicus* die 19 *Auguſti*, anno *Chri-*
" *ſtiano* 977) obſervatum fuit *Cahiræ* in *Ægypti*
" metropoli initium eclipſis ſolaris, cum altitudo ſolis

" eſſet

" eſſet 15° 43′. quantitas obſcurationis 8 digit. Ea " finita, ſol elevabatur $33\frac{1}{2}$ *gr. Ex Schickardo in* " *MS.*" This Eclipſe was *Decemb.* 13, in the Year of Chriſt 977, the Beginning at 8^h 25′, and the End at 10^h 45′ apparent Time in the Morning.

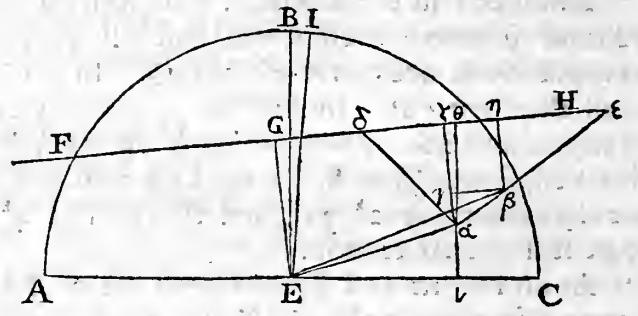
" Anno eodem die Sabbathi, videlicet 29 menſis " *Sywal* (numero decimi, qui Paſchalis eſt eorum) " eclipſis Solis occupavit digitos $7\frac{1}{2}$. In principio " Sol altus fere 56°. In fine Sol occiduus elevaba- " tur gradibus 26. *Ex Schickardo in MS.*" —— This Eclipſe was *June* 8, in the Year of Chriſt 978. The Beginning at 2^h 31′, and the End at 4^h 50′ apparent Time Afternoon.

" Anno Hegiræ 368 (qui incœpit die 9 *Auguſti*, " anno *Chriſtiano* 978) die *Jovis*, 14 *Sywal*, Luna " fuit orta cum defectu, qui ad $5\frac{1}{2}$ digitos accrevit; " cum extaret ſupra horizontem gradibus etiam 26 " ſubaudio finem tunc accidiſſe). *Schickardus.*"---- This Eclipſe was *May* 14, in the Year of Chriſt 979; but as the Middle cannot be known from what was obſerved of it, I made no uſe thereof in this Enquiry. The Account concludes with the following Paragraph:

" Hæ tres obſervationes habitæ ſunt ab *Ibn-Junis*, " qui juſſu Regis *Abu-Haly Almanzor*, ſapientis, " *Ægypto* tunc Imperantis, rebus vacabat cœleſ- " tibus. Hujus authoris tabulas habet *Jac. Golius* " Profeſſor *Lugdun.* (qui mihi inde communicavit " iſta) in quibus plures aliæ, ſui et ſuperioris ævi ob- " ſervationes extant. Locus obſervationis propinquus " urbi *Cahiro. Schickardus.*"

That

That the before-mention'd ſolar Eclipſes might be applied to the Examination of the Lunar Motions, I contrived the following Method; which I think renders Eclipſes of the Sun as uſeful at leaſt as thoſe of the Moon are in that Buſineſs.



Let *ABC* in the annexed Figure repreſent half the Earth's enlightened Disk, *AEC* a Portion of the Ecliptic projected thereon *FGH* the Path of the Moon's Shadow over the Disk, *EI*, the univerſal Meridian, α the Situation of the Place at the Beginning of the Eclipſe, β its Situation at the End thereof, δ the Centre of the Shade at the Beginning, and ε its Centre at the End of the Eclipſe. Draw *EG*, $\alpha\zeta$, and $\beta\eta$, perpendicular to the Path of the Shadow, $\beta\gamma$ parallel thereto; join $\alpha\delta$ and $\beta\varepsilon$, and through α draw $\theta\alpha\iota$ perpendicular to *AC*.

Then (computing the true Places of the Sun and Moon at the obſerved Times of the Beginning and End of the Eclipſe) we ſhall have given $\delta\varepsilon$ the Motion of the Moon from the Sun in her Orbit during the Time of the Eclipſe, and $\alpha\delta = \beta\varepsilon$ the Semidiameter of the *Penumbra*; which are to be reduced into ſuch Parts as the Semidiameter of the Disk contains

tains 10000: The Angles BEI and BEG, being found by Methods commonly known, GEI their Sum or Difference will be likewiſe given. Alſo $E\alpha$ and $E\beta$ will be Sines of the Sun's Altitude at the Beginning and End of the Eclipſe reſpectively; $IE\alpha$ and $IE\beta$ are the Angles at the Sun between the Vertex of the Place and the Pole of thoſe Times; which being found, the Angle $\alpha E\beta$, their Difference will be known, from whence the Line $\alpha\beta$ and the Angle $E\alpha\beta$ may be computed.

The Angle $GE\alpha$ is the Sum or Difference of the known Angles GEI and $IE\alpha$: In the Figure before us, the Complement of this to a Semicircle is $E\alpha\gamma$; which being ſubtracted from $E\alpha\beta$ leaves the Angle $\gamma\alpha\beta$, from whence and the Line $\alpha\beta$, $\alpha\gamma$, and $\gamma\beta = \zeta\eta$ may be found.

Let $a = \delta\varepsilon - \zeta\eta$, $b = \alpha\delta = \beta\varepsilon$, $c = \alpha\gamma$, and $x = \beta\eta = \gamma\zeta$.

Then $\sqrt{bb - xx} = \eta\varepsilon$, and $\sqrt{bb - cc - 2cx - xx} = \delta\zeta$, by *Eucl.* 1.47.

Conſequently $a - \sqrt{bb - xx} = \sqrt{bb - cc - 2cx - xx}$ which being reduced, gives us the quadratic Equation $xx + cx = \frac{4a^2b^2 - a^4 - 2a^2c^2}{4aa + 4cc}$. This Equation ſolved, gives us the Value of x, from which $\delta\zeta$ and $\eta\varepsilon$ will be likewiſe had. In the Triangle $\alpha\zeta\theta$ we have $\alpha\zeta$ and the Angle $\zeta\alpha\theta = GEB$ given, whence $\alpha\theta$ and $\zeta\theta$ may be found: Conſequently $\delta\theta$ will be known; and from the obſerved Time of the Beginning of the Eclipſe, and hourly Motion of the Moon from the Sun, the Time when the Centre of the Shade is at θ will be had. Laſtly, in the Triangle $E\iota\alpha$, we have given the Side $E\alpha$, and the Angle $E\alpha\iota = BE\alpha$

BEα (the Sum or Difference of the Angles BEI and IEα); therefore the Sides Eι and $\alpha\iota$ may be found. But Eι is the Distance of the Moon from the Sun in the Ecliptic, and $\alpha\iota \mp \alpha\theta$ the Moon's Latitude at the Time when the Centre of the Shade is at θ; which may be compared with the Computation from the Tables for that Time.

By this Means I compared the aforesaid Solar Eclipses with the Tables, and found the Difference in Longitude and Latitude, as follows.

A.D.	Apparent Time at Greenwich.	Dist. ☽ a ☉ from Eι.	Lat. ☽ from $\vartheta\iota$.	☽ a ☉ by Tab.	Lat. ☽ by Tab.	Diff. from Obser. in Long.	Diff. from Obser. in Lat.	Diff. in Lat. from Digits observed.
364	June 16. h 2 ′ 4 ″ 20	′ ″ 39 41 in consec.	′ ″ 34 37 Nor.	′ ″ 35 25	′ ″ 37 26 Nor.	′ ″ −4 16	′ ″ +2 49	
977	Dec. 12. 19 12 30	43 39 in antec.	30 23 Nor.	36 3	31 50 Nor.	+7 36	+1 27	− 2 36
978	June 8. 1 16 10	29 3 in consec.	8 24 Sou.	37 48	3 21 Sou.	+8 45	−5 3	+ 3 38

The Agreement there is between the two last of these Differences in Longitude, shews that the Tables represent the mean Motion of the Moon's Apogee very well for above 700 Years, the Moon being very near her Perigee at the Time of one of those Eclipses, and near her Apogee at the Time of the other.

By the same Method I also compared the Sun's Eclipse, *July* 29, 1478. (which appears, from what is related of it, to have been carefully observed by *Bernard Walther* at *Nuremberg*), with the Tables, and found the Difference in Longitude to be + 10′ 29″, and in Latitude + 9′ 12″. This wide Difference in Latitude, from the Tables, that agree so well with the former ancient Observations, confirmed me in the Opinion, that the *Nuremberg* Obser-

Obſervations are too inaccurate to determine any thing from them in this Affair.

The Eclipſes recorded by *Ptolemy* in his *Almageſt*, are moſt of them ſo looſely deſcribed, that, if they ſhew us the Moon's mean Motion has been accelerated in the long Interval of Time ſince they happened, they are wholly incapable of ſhewing us, how much that Acceleration has been. There are indeed two or three of them attended with ſuch lucky Circumſtances as not only plainly prove that there has been ſuch an Acceleration, but alſo help us to gueſs at its Quantity. One of theſe is the Eclipſe, ſaid by *Hipparchus* to have been obſerved at *Babylon*, in the 366th Year of *Nabonaſſar*, the Night between the 26th and 27th Days of *Thoth*, when a ſmall Part of the Moon's Disk was eclipſed from the North Eaſt, half an Hour before the End of the Night, and the Moon ſet eclipſed. This was in the Year before Chriſt 313, *Decemb.* 22. The Middle of this Eclipſe at *Babylon* (ſuppoſing with *Ptolemy* the Meridian of that Place to be 50′ in Time Eaſt of the Meridian of *Alexandria*), by my Tables was *Dec.* 22. $4^h\ 4'$ apparent Time; the Duration was $1^h\ 37'$, *Ptolemy* makes it $1^h\ 30'$ nearly; whence the Beginning ſhould have been about $8^h\ 15'$ after Midnight: According to *Ptolemy*, the Night at *Babylon* was at that Time $14^h\ 24'$ long, and therefore Sun riſe at $7^h\ 12'$ after Midnight; and as the Moon had then South Latitude, and was not quite come to the Sun's Oppoſition, her apparent Setting muſt have been ſomething ſooner, *i. e.* more than an Hour before tha Beginning of the Eclipſe, according to the Tables; whereas the Moon was ſeen

eclipſed ſome Time before her Setting; which, I think, demonſtrates, that the Moon's Place muſt have been forwarder, and conſequently her Motion ſince that Time leſs than the Tables make it by about 40′ or 50′. But the computed Place of the Moon in each of the before-mentioned Solar Eclipſes obſerved at *Grand Cairo*, being about 8′ before her Place, from Obſervation ſhews us, that the mean Motion of this Luminary has been ſomething greater in the laſt 700 Years than the Tables ſuppoſe it, and therefore muſt have been accelerated.

This Acceleration is further confirmed by the Eclipſe, which *Hipparchus* ſays was obſerved at *Alexandria*, in the 54th Year of the ſecond *Calippic* Period, the 16th Day of *Meſſori*, when (he ſays) the Moon began to be eclipſed half an Hour before her Riſing, and was wholly clear again in the Middle of the third Hour of the Night. This was in the Year before Chriſt 201. *Sept.* 22. The Middle of this Eclipſe at *Alexandria* by the Tables was *Sept.* 22. 7^h 44′ apparent Time; and the Duration 3^h 4′, which makes the Beginning at 6^h 12′ apparent Time, that is, about 10′ after the riſing of the Moon at *Alexandria*, or 40′ later than the Beginning from Obſervation. This Difference in Time makes a Difference of near 20′ in the Moon's Place.

The moſt antient Eclipſe of which we have any Account remaining, namely that related by *Ptolemy*, to have been obſerved at *Babylon* the firſt Year of *Mardokempad*, in the Night between the 29th and 30th Days of *Thoth*, in which the Moon began to be eclipſed when one Hour after her Riſing was fully paſt; if, by reaſon of the Latitude of the Expreſſion,

preſſion, it be not a direct Proof of the Acceleration, it may nevertheleſs help to limit its Quantity. This Eclipſe was in the Year before Chriſt 721. *March* 19. The Middle whereof at *Babylon*, by the Tables, was *March* 19. 10^h 26′ apparent Time; and the Beginning at 8^h 32′, the apparent Riſing of the Moon at that Place was about 5^h 46′ Afternoon; ſo that the obſerved Beginning of the Eclipſe was at leaſt 6^h 46′ Afternoon, *i. e.* not above $1\frac{1}{4}^h$ before the Beginning, by the Tables: Wherefore the Moon's true Place could precede her Place by Computation but little more than 50′ at that Time.

If we take this Acceleration to be uniform, as the Obſervations whereupon it is grounded are not ſufficient to prove the Contrary, the Aggregate of it will be as the Square of the Time: And if we ſuppoſe it to be 10″ in 100 Years, and that the Tables truly repreſent the Moon's Place about *A. D.* 700. it will beſt agree with the before-mentioned Obſervations; and the Difference between the Moon's Place by the Tables and her Place in the Heavens, will be as follows.

Years before Christ.	Error of Tab.	Years of Christ.	Error of Tab.	Years of Christ.	Error of Tab.
	′ ″		′ ″		′ ″
700	—56 6	200	—12 30	1100	+ 4 0
600	—49 50	300	— 9 20	1200	+ 4 10
500	—44 0	400	— 6 30	1300	+ 4 0
400	—38 30	500	— 4 0	1400	+ 3 30
300	—33 20	600	— 1 50	1500	+ 2 40
200	—28 30	700	0 0	1600	+ 1 30
100	—24 0	800	+ 1 30	1700	0 0
A.D.0	—19 50	900	+ 2 40		
100	—16 0	1000	+ 3 30		

I am,

SIR,

Your humble Servant,

Richard Dunthorne.

XV. Alberti Halleri, *Archiatri Reg. Medicin. Prof.* Gotting. & R. S. Lond. *S.* Fabricæ morbosæ in cadaveribus repertæ historiæ aliquæ.

OBS. I.

Read, June 8. 1749. IN femina quadragenaria reperi Venam cavam inter renalis sinistræ originem, et inter iliacas venas, enormiter angustatam, ut vix quid-

quidquam tranſmitteret. Aliquid tamen polypoſi, duri ſanguinis in ejus cavitate, quæ inter craſſas membranas arctiſſima fuit, repertum eſt: Vena vero ſpermatica dextra enormiter dilatata, unciali diametro venæ cavæ locum ſubiit, et ſanguinem, excluſum a via ſolita, reddidit ureteris venæ, alioquin in ſano corpore exiguæ, ortæ ab iliaca dextra.

Rariſſimi hujuſmodi coalitus exemplum aliud reperi in *Johannis Rhodii Mantiſſ. Anatom. Obſ.* XXI.

Ex utroque conſtat, etiam in maximis truncis vaſorum corporis humani morbos ſubnaſci poſſe, et obſtructionem in venis vere dari; et canales minimos, quando ſanguinis, ſolitis viis excluſi, impetus eo vergit, patentiſſimos reddi poſſe.

OBS. II.

In femina decrepita, quam centum annorum ætate eſſe dictitabant, non tamen ita firma fama, ut eam ſequi tuto liceat, ætatis ſummæ aliqua veſtigia reperi.

Tota corporis fabrica durior fuit, vel cultro judice: glandulæ conglobatæ ſanæ, ſed ſimiles fere renalis carnis firmitati; nervi præduri; celluloſa tela ubique vix ſciſſilis; coſtarum cartilagines nondum oſſeæ, niſi ſupremam velles, quæ cum ſterno, nexu vix ullum diſcriminis veſtigium relinquente, conferruminata erat: ſed in ea coſta id non rarum eſt.

Verum in arteria magna multæ mortis cauſæ fuerunt. Ampliſſima primum aorta, qua ex corde prodit, ut quinque unciarum et linearum duarum eſſet ambitus. Deinde aperto hoc, non aneuryſmate quidem, ſed ampliſſimo tamen ſinu, adparuit.

(1) Val-

(1) Valvulas cordis arterioſas, partim induratas, partim etiam petroſis humoribus varias eſſe, perinde ubi *Cowteri* fere figuram demonſtrant, [*Mythol. reform. Tab.* XL.] Reliquæ valvulæ venoſæet arterioſæ cordis vix mutatæ.

(2) In arteria aorta tum ad cor, tum in thorace, in abdomine denique, membrana interna undique lacera, quaſi ſcabendo in eminentes criſtas, liberas, fluctuantes, mutata, tanquam ulcere aliquo conſumta eſſet. Hæ ſquamæ paſſim oſſeæ erant, alicubi etiam petroſæ, et acervi tophaceorum granorum plerorumque vaſorum ex aorta oriundorum oſtia obſidebant. Membrana muſculoſa ſana fuit, tum externa, ut vitium omne in intima ſederet.

(3) In hypogaſtricis, iliacis, pelvis arteriis, et iis quæ ex pelvi ad nates exeunt, plurimæ cruſtæ oſſeæ, ſubflexiles tamen, in quas mutata erat interna harum arteriarum membrana, ita tamen adhærentibus fibris carneis, ut paſſim calculoſæ ſquamæ ductubus tranſverſis inſcriberentur; nihil tamen hic petroſi: In omnibus arteriis corporis prædura et figurata, teretia ſanguinis craſſamenta, ſuo canale tamen minora.

(4) Veſicula fellea flava bile, vix amara, plena, et calculis ad viginti, exiguis, anguloſis, quorum unus ita obſidebat oſtium ductus cyſtici, propius paulum choledocho, quam prima cyſtici valvula, ut bilis, contra quam ſolet, ex veſicula premendo expelli non poſſet. Dulcedinem in bile, quando in calculos coivit, plerumque reperire ſoleo.

Hæc fere fuerunt, quæ obſervationem mererentur, et demonſtrant arteriarum internam membranam ab ictibus repetitis cordis tandem partim indureſcere, partim inter oſſificata ſpatia rumpi, ſic debilitari

bilitari truncum aortæ, et ad aneuryſmata reddi pronum. Demonſtrat etiam, in ipſo ſanguine ubique terram veram calculoſam circumvehi, nec in renalibus ſolum viis deponi, ſed ibi hærere et congeri, ubi ruptæ ſunt leviſſimæ membranæ vaſorum, et attractio terrearum molecularum ad aſperas inæquales ſuperficies major eſt.

XVI. *A Memoir on the* Lacrymæ Batavicæ, *or Glaſs-Drops, the* tempering *of* Steel, *and* Efferveſcence, *accounted for by the ſame Principle. By* Claud, Nic. le Cat, *M. D. F. R. S.* &c. *Tranſlated from the* French, *by* T. S. *M. D.*

Read June 15. 1749. THE Glaſs-Tear, or Drop, commonly called *Lacryma Batavica*, or *Lacryma Boruſſica*, becauſe it was firſt made in theſe Countries, is much celebrated among Natural Philoſophers, upon account of the ſingular Phœnomena which it exhibits, and which have for a long Time exerciſed their Sagacity.

The Make of this Drop is as ſimple as its Explanation is difficult. It is the Work of the meaneſt Workman in a Glaſs-houſe. On the Top of an iron Rod they take up a ſmall Quantity of the Matter of Glaſs in Fuſion: They let it drop into a Pail of Water: The Drop makes that Part of the Water which it touches, to boil with a hiſſing Noiſe, as a red-hot Iron would do, which it reſembles in that Inſtant; and when it does not break in this Operation,

ration, as it moſt frequently does, it forms the little pyramidal Maſs, which is known by the Name of a Glaſs-Drop; the Effects whereof I will firſt relate, and then endeavour to account for them.

Experiment 1. This Drop is of ſuch Hardneſs and Reſiſtance, that it bears ſmart Blows of a Hammer, without breaking.

Exper. 2. Nevertheleſs, if you grind the Surface of this Drop which reſiſted the Hammer, or if you only break the Tip of the ſmall End or Tail, the Whole ſhatters into Powder.

Exper. 3. This Shattering of the Drops is attended with a loud Report; and the Duſt or Powder to which it is reduced, ſhoots out, and ſcatters all around.

Exper. 4. If the Drop be ground with Powder of Emery, imbibed with Oil, it often eſcapes breaking.

Exper. 5. If this Experiment be made in the Air-Pump, the Drop burſts with greater Impetuoſity, ſo as ſometimes to break the Receiver and its Duſt is finer than when done in the open Air; and if it be made in the dark, the Drop in burſting produces a little Light.

Exper. 6. If this Drop be annealed in the Fire, it loſes all theſe Singularities; and being reduced to the State of common Glaſs, it eaſily breaks under

der the Hammer; and does not burſt upon breaking the ſmall End.

Exper. 7. The Drops that are made by letting them cool in the Air, produce no other Effects than thoſe which have been annealed.

The firſt natural Philoſophers who endeavoured to inveſtigate the Cauſe of theſe Phænomena, imagined that they found it in the Air. Some of them ſuppoſed, that this Air was ſhut up in the Drop by the Cruſt which the cold Water forms on its Surface while it is yet red-hot; and attributed its Rupture to the Violence with which this Air iſſued thro' the too narrow Paſſage made for it, in breaking the ſmall End of the Drop. Others maintained on the contrary, that the Drop, in this State, contained no Air at all, nor any thing but Particles of Fire, or ſubtile Matter; or, in one Word, a Vacuum of Air; and that the ſudden burſting of the Drop was occaſioned by the impetuous Entry of the Air into this ſort of Vacuum. In fine, the *Carteſians* have ſubſtituted their ſubtile Matter in the room of this exterior Air, and ſay, that the Drop is burſted by the leſs ſubtile Particles of this Matter; which entering with Force into the Drop by the Opening made therein, and finding large Pores on the Inſide, and ſmall ones on the Outſide, burſt the Sides of the Drop, by ruſhing from the Centre to the Circumference, wherewith its Paſſage is obſtructed.

Meſſ. *Mariotte* and *Homberg* came afterwards; Being provided with an Air Pump, they cauſed one of theſe Drops to be broken *in Vacuo*; and *Hom-*

berg having obſerved, that it broke therein better and with a louder Report than in the open Air; they both inferred, that neither the impetuous Entry of the outward Air, nor that of a Fluid ſomewhat leſs groſs, could be the Cauſe of this Shock; becauſe the Receiver of the Air-Pump is void of theſe Fluids; and even if a little ſhould remain therein, it is too much rarefied, and too thin to be capable of ſuch an Effect.

Mr. *Mariotte*, thro' ſome Remains of Attachment to an Opinion, which he had held to that Time, did not intirely exclude the exterior Air from the Cauſe of the Phænomenon of the Drop; but thought proper to add another to it; which he makes uſe of as a Subſtitute in Caſes like thoſe of the preceeding Experiment, where the Inſufficiency of the Air, or of a Fluid nearly ſimilar to it, plainly appears.

Mr. *Homberg* ſhews no Indulgence to the exterior Fluid; and aſcribes the Whole to the new Cauſe, which is, the Quality of temper'd Glaſs, which the Drop acquires, like Steel, by being thrown red-hot into cold Water. This Tempering, according to theſe great Academicians, confers at the ſame time more Springineſs to the Parts, and leſs Connection with each other. When a Steel Sword-Blade is bent forcibly, it breaks more eaſily than one of Iron; and the Jarring which is occaſioned by its Spring, is capable of breaking the other Parts of the Blade: And thus we ſee, that it generally breaks into ſeveral Pieces. This Blade is the Image of the *Lacryma Batavica*, or Glaſs-Drop.

This is the Point to which I found Things brought, when I began to ſtudy the Phœnomena of the Glaſs-Drop.

The

The Air was partly baniſhed from the Inſide of this Maſs of Glaſs: There is none in the liquid red-hot Matter of a Glaſs Furnace. It was purely out of Complaiſance for a generally received Opinion, that Mr. *Mariotte* allowed the exterior Fluid any Share in the Phænomenon; and Mr. *Homberg* put the finiſhing hand to its Excluſion. But the Sort of Temper given to the Drop by plunging it red-hot into cold Water, and its Compariſon with temper'd Steel, is not ſo much a Cauſe as a Compariſon: And moreover, is this Compariſon very juſt? Can there be any between a long, thin Sword-Blade, which breaks into two or three Pieces, and a thick inflexible Maſs of Glaſs, which flies into Powder. The Tail alone of the Drop might ſeem to favour this Parallel: But an Experiment, which I made, entirely deſtroys this Opinion, and proves, that it is not the Spring, or the Vibrations of the Parts of the Drop, that occaſion its burſting.

I put about half the Tail of a Glaſs Drop into a Vice between two Bits of Deal-board of about a Finger's Breadth. I ſcrew'd the Vice, till I ſaw this ſmall Cylinder or Thread of Glaſs make Impreſſions in the Wood on each Side for its Lodgment, in order to be ſure that it could not be ſuſceptible of Vibrations. In this Condition I broke the End of the Tail, ſupporting it on my Nail, to prevent forceing any Part but the End which I intended to break; and in order to be the more certain of giving no Shock to the Part that was ſqueezed in the Vice. My Drop flew into Powder as uſual; and the Portion ſecured between the two Bits of Wood, perfectly retained its Figure in the Impreſſions wherein

it was lodged. But when I touch'd this little Cylinder, it was reduced to Powder, much in the ſame manner as is ſaid to have happen'd to ſome Men who had been ſtruck with Lightning. Now, it was not poſſible for this Glaſs to receive, or convey to the Body of the Drop any Vibrations; or if any, they muſt be infinitely ſmall; and yet the Effect was preciſely the ſame as uſual. Therefore the Syſtem of Vibrations is not happier than thoſe invented before it.

It is among the Glaſs-workers, and in their Art, that the Secret of the *Lacryma Batavica*, or Glaſs-Drop, is to be ſought; and there it is that I think I have diſcover'd it.

All thoſe who have ſeen Glaſs-houſes know, that when a Piece fails in the Hands of a Workman, he throws it aſide; and this Piece is not long expoſed to the Air, before it breaks in Pieces: And when the ſame Workman has ſucceeded in making a Piece, and is willing to preſerve it, he takes great Care not to let it cool in the Air; but carries it hot into another Oven of a moderate Heat, where he leaves it for a certain Space of Time. And this laſt Operation is called *Annealing the Glaſs*.

A natural Philoſopher, who is Witneſs to this Management, ought to inquire into the Reaſons and Neceſſity of it.

How comes it that the Glaſs, which cools in the Air, breaks; and when it has been nealed, it does not break? This is the Reaſon, if I am not miſtaken.

A Bit of melted Glaſs, red-hot and liquid at the ſame time, is in that State, purely becauſe its Particles are divided by ſo great a Quantity of Particles of

of Fire, or ſubtil Matter ſo violently agitated, that theſe component Parts of the Glaſs do hardly touch one another: They ſwim, if I may be allowed the Expreſſion, in a Flood of this Matter of Fire; and for this Reaſon it is, that melted Glaſs affects the Colours of Flame.

When this Subſtance is expoſed to the Air, the Coolneſs of this Fluid, which touches the Surface of the Glaſs, cools that Surface firſt; that is, brings the Particles nearer together, braces their Pores, and thus impriſons the Particles of Fire, which ſtill fill the Inſide of this Subſtance. While theſe fiery Particles find Pores enough on the Surface, to move freely, the Glaſs continues whole; but when the Glaſs grows colder, that is, when the Pores of its Surface begin to confine theſe fiery Particles; then their whole Action is exerted againſt the Parts of the Glaſs, which they break into a thouſand Pieces. In order to avoid this *Fracas*, nothing more is requiſite than to keep the Pores on the Surface of the Glaſs wide enough, that the fiery Particles contain'd therein may paſs through, and fly off inſenſibly. Now, this is what is done, by putting the hot Piece of Glaſs into an Oven, the moderate Heat of which keeps theſe Pores open to a certain Pitch, and yet allows the Glaſs to acquire its due Conſiſtence in this State of middling Poroſity: Wherein conſiſts the Annealing of Glaſs and other fuſed Subſtances.

Hence it appears, that all unnealed Glaſs carries within itſelf its Principle of Deſtruction, which is the Matter of Fire impriſoned. But the *Lachryma Batavica*, or Glaſs-Drop is in this reſpect, in a worſe Caſe ſtill than unnealed Glaſs: For beſides that it has not been expoſed to this ſecondary Heat, which

which keeps its Pores open, till the Glaſs has acquired its due Conſiſtence, for Fear that the Coolneſs of the Air alone ſhould not cloſe its Pores ſoon enough, and impriſon a ſufficient Quantity of the igneous Matter, it is ſuddenly thrown into cold Water, which by its Coldneſs and Weight is fitter than the Air to produce ſuch an Effect ſpeedily and effectually. Wherefore the only ſurpriſing Circumſtance in theſe Glaſs-Drops is, that any of them remain without breaking, by the great Quantity of igneous Matter ſuddenly ſhut up in them by the cold Water. And indeed this Accident befalls more than one half of them; and thoſe that eſcape, doubtleſs owe their Preſervation to the ſpherical or cylindrical Figure of the compact Shell, which the Coldneſs of the Water forms on their Surface: For it is well known that this Figure produces an Equality of Reſiſtance on all Sides, which conſiderably encreaſes the reſiſting Force: And this is the firſt Reaſon why, as ſoon as this Æquilibrium is broken, either by rubbing away one Side of this Surface, or by making a Hole in it, or, in fine, by breaking the ſmall End of the Drop; the Reſiſtance is inſtantly overcome, and the igneous Matter, impriſoned within the Glaſs, and conſtantly upon the Strain againſt it, burſts it into Powder.

This deſtroyed Æquilibrium is but one Diſpoſition that favours the Effect of the impriſon'd igneous Matter: But the Communication which is opened for it with the ſubtile exterior Fluids, rouſes this Matter which is in a State of Inactivity, develops its Spring, kindles it ſomewhat in the Manner of the Phoſphorus, which produces no Effect while cloſe

ſhut

ſhut up, but takes Fire, as ſoon as a free Communication with the outward Air is given it.

On the Union of theſe Cauſes depend the Phœnomena of the Glaſs-Drop. It is of a Hardneſs that reſiſts the Strokes of a Hammer, becauſe the violent Condenſation, given to its Surface by the cold Water, into which it was thrown when in a ſoft State, render'd its Texture very cloſe, compact, and conſequently hard.

It burſts with great Noiſe; and in ſo doing it retains the Character of all the Effects produced by the Exploſion of the igneous Matter.

Its Duſt flies two or three Feet all around, becauſe it is puſh'd forward by the Action of a Fluid contained in its Centre; which would not happen, if it had been the Effect of an exterior Fluid. This ſame Duſt of the Glaſs-Drop darts forward with greater Force in the Air-Pump than in the Air, becauſe the Air is an Obſtacle, of which it is freed in the Receiver of the Air-Pump: Wherefore it ſometimes breaks the Receiver; and for the ſame Reaſon its Duſt is finer, that is, more minutely broken, as being done by a ſtronger Power, and leſs counterbalanced.

This violent Exploſion produces Light, becauſe the Property of ſhining Lightning is always the Effect of ſuch an Exploſion of the Matter of Fire: Wherefore this Fact affords another Proof, that this Matter is the Principle of the Phœnomenon of the Drop.

If the Surface of the Drop be ground with fine Powder of Emery, imbibed with Oil, it frequently happens, that it does not burſt; becauſe the Sort of oily Maſtic that reſults from this Mixture, ſtops the Pores

Pores of the Drop, and prevents the ſudden Communication of the exterior Fluids with the impriſoned igneous Matter; and as Glaſs cannot be ground with very fine Emery and Oil, but by long rubbing; ſuch rubbing heats the Drop, and gradually opens the Pores ſo as to grant an inſenſible Paſſage to the igneous Matter, whereby the Drop becomes at laſt in the ſame Caſe with nealed Glaſs; and in the Caſe in which itſelf is, when it is put into the Oven to be nealed.

When a Glaſs-Drop is made, by ſuſpending it in the Air only, it does not break ſooner than nealed Glaſs: Becauſe as this ſmall Maſs of Glaſs retains its Heat a long while in the Air, the Heat ſerves as a Nealing-Oven, and keeps its Pores dilated long enough for the igneous Particles to find a free Paſſage.

The Principles, by which I have accounted for the Effects of the Glaſs-Drop, are not confined to this Phænomenon alone: They are more general than is commonly imagined. Some Corollaries, which I ſhall deduce from them, will prove what I advance.

The Tempering of Steel.

Steel, like the Glaſs-Drop, acquires its Hardneſs by being plunged into Water: And if Meſſ. *Mariotte* and *Homberg* had compared them together in this Circumſtance alone, they had been in the right.

The moſt celebrated natural Philoſophers, in order to account for the tempering of Steel, have had recourſe to different Arrangements of its Parts produced by the Fire, and fixed, by the Cold of the Water, in the new State, in which the violent Heat had put them.

The

The Mechaniſm of the tempering of Glaſs Drops, applied to that of Steel, is the the moſt ſimple of all the Hypotheſes, and anſwers all its Properties, which are theſe:

1. Tempered Steel has a coarſer Grain. 2. Is is increaſed in Bulk. 3. It is harder and brittler. 4. By annealing it becomes leſs brittle.

Explanation. Steel made red-hot is filled and ſwelled, and its Pores dilated, by the igneous Matter. In this State, the cold Water, into which it is thrown, compreſſes and cloſes the Parts of the Surface, while the impriſoned igneous Matter dilates the Pores within: Thus the Texture of Steel becomes more compact by theſe two Cauſes, while its Pores are dilated.

Theſe large Pores conſtitute the coarſe Grain of tempered Steel. Its Dilatation by the igneous Matter, which could not be thoroughly condenſed by the Cold of the Water, cauſes its augmented Bulk: The cloſe Texture of the Subſtance that ſurrounds the Pores, and the impriſoned igneous Matter, occaſion its Hardneſs and Brittleneſs. Its Recoction or Annealing deprives it of this Brittleneſs, and of a Part of its Hardneſs: Becauſe it opens this Texture, which it relaxes at the Expence of the neighbouring Pores, and drives the igneous Matter out of it.

Fermentation.

The Fermentation of Acids and Alkali's ſeem, to me to be another Corollary of the ſame Principle.

First, It is pretty univerſally allowed, that the acid Particles have the Figure of ſmall Needles; and that Alkali's are ſpheroidal or polyhedrous Bodies with a vaſt Number of Bodies proper to admit the acid Needles.

Secondly, Experience ſhews, that Salts are alkaliſed by Fire, and that our Juices are alkaliſed by Heat, *&c.* What can the repeated Action of the Fire produce on Salts, in order to alkaliſe them? It calcines them, blunts their Points, and hollows them with a vaſt Number of Pores; and we ſee with the naked Eye, that Calcination has this Effect on all Bodies. In a word, it converts an angular very ſolid Body into a very porous and light Spheroid; and this Body is an Alkali by the firſt Suppoſition.

Thirdly, Calcination introduces, and generally leaves in the Pores of the calcined Body, after the Operation, a great Quantity of igneous Matter. This Matter is perceptible to the Senſes in the *Lapis Bononienſis*, which becomes a Phoſphorus by Calcination; in Lime-Stone, which by Calcination is furniſhed with ſo great a Quantity of igneous Matter, that in the Effervescence, which is raiſed in it by throwing a little Water on this Stone, you may kindle Sulphur or a Match by it. The Alcaline, or alcalized Salts alſo, that is, thoſe which are calcined, have their Pores full of the igneous Matter.

Fourthly, Such is the Nature of the igneous Matter, that it tears aſunder whatever oppoſes its Paſſage,

ſage, and makes it fly off with a Report. This Principle is univerſally allowed: The Effects of Gunpowder, of Volcano's and Earthquakes, prove it: And to come nearer our Subject, unnealed Glaſs breaks in the Air, and the *Lacryma Batavica* does as much upon breaking its ſmall End.

Whereas an Alkali is a ſpongious Body filled with the igneous Matter, and an Acid are Points proportioned to theſe Pores; theſe ought to be regarded as ſo many Pegs or Pins, which enter into the Holes on the Surface of the Alkali, and fill them up exactly: Whereby the igneous Matter is impriſoned; and by the preceding Principle it burſts the alcaline Globule with Noiſe, and ſcatters around the acid Pegs, in the ſame manner as it burſt the Glaſs-Drop.

A Mixture of an alkaline and acid Liquor being compoſed of an infinite Number of ſuch Particles that burſt and broke to Pieces, the Liquor muſt take up more room, or ſwell. The Particles of Air therein contained, being toſſed about by all thoſe little Exploſions, together with the neutral Liquors, which are a Vehicle to the Salts, form the Scum or Froth; and the igneous Matter, which gets out of the Alkali's, and is agitated by the Shocks of all theſe Exploſions, produces Heat, drags with it the aqueous and other volatile Particles, which form the Steam.

Yet there are cold Fermentations, becauſe then, either the Motion of the Particles of Fire, and their *Fracas*, is inconſiderable; or becauſe theſe Particles fly off eaſily by a direct Motion. Moreover, at this Day that we have it in our Power to be convinced, that the *Pruſh* or Stream of electric Matter is very

cold, nobody will be ſurpriſed, that a Stream of the Matter of Fire may produce Cold.

If all the alcalious Corpuſcles burſted at once, the Fermentation would laſt but an Inſtant: But as the acid Liquor requires a certain Space of Time, to penetrate the whole alcaline Liquor, and fill the Pores of the alcalious Corpuſcles, the Fermentation is performed ſucceſſively in a certain Number of Corpuſcles at a time, until they are all broken: And this Succeſſion conſtitutes the Duration of the Fermentation; which ceaſes when there are none of the Alkali's left entire.

Theſe Principles not only ſerve to explain the Fermentation which reſults from the Mixture of Acids and Alkali's, but alſo almoſt all the Motions of this Kind, which are occaſioned by the Mixture or Penetration of two or more Subſtances.

For Example; Lime, which we have mentioned above as a Body filled with the Matter of Fire, and which produces an Effervescence capable of lighting Sulphur, if Water be thrown on it; Lime, I ſay, produces this Effect, only becauſe the Particles of Water, which enter into its Pores, have a Tendency to ſhut up the igneous Particles more cloſely. It is by a Mechaniſm entirely ſimilar, that *Homberg*'s Phoſphorus kindles into Flame, upon being expoſed to the Air: 'Tis upon this Principle likewiſe, that a Mixture of Spirit of Wine and Water acquires a new Degree of Heat; and ſo of other Phænomena of this Nature.

——— Le Cat.

XVII.

XVII. *Extract of a Letter from Mr. Prof.* Geo. Matthias Boſe, *of* Wittemberg, *to Mr.* W. Watſon, *F. R. S. on the Electricity of Glaſs, that has been expoſed to ſtrong Fires.*

Dated *March* $\frac{7}{17}$, $174\frac{8}{9}$.

* * *

Read April 6. 1749. IT ſeems to me that a Glaſs Ball, which has oftentimes been employed for violent Diſtillations, and other chymical Operations, does ſend forth the Electricity incomparably more ſtrong than any other Glaſs, which never ſince its making had been expoſed to a violent Fire. As I am the firſt that has mentioned this notable Circumſtance, be pleaſed to let me have the Honour of this Improvement in the Philoſophical Tranſactions.

* * *

ERRATA.

No. 490. p. 583. l. 12. for 10 *Miles* r. 8 *Miles*.

No. 492. p. 38. for *ciſtitome* r. *cyſtitome*; and the ſame where-ever the Word occurs.

PHILOSOPHICAL TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Preſent Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Conſiderable Parts of the WORLD.

LONDON:

Printed for C. DAVIS, PRINTER to the ROYAL SOCIETY; over-againſt *Gray's-Inn-Gate* in *Holbourn.*

M. DCC. L.

PHILOSOPHICAL TRANSACTIONS

OF THE

ACADEMY

OF THE

INGENIOUS

IN MANY

Venta Icenorum.

aa. The Road to Castor.
b. A Spring Well.
cc. The remains of a Wall
d. The Porta Prætoria.
e. Castor Church built partly of Roman bricks.
f. The Base of an old Tower lately discover'd
gg. The Ruins of a Wall.
hh. The bottom of a Wall
i. The Ruins of an old Tower over grown with Ivy.
l. The Porta Decumana.
mmmm The Rampart.
nnnn The Ditch.
oo. A Passage out thro the Rampart but whether Original Gates or not is uncertain.
pp. The River Wentsum or Wentsor.

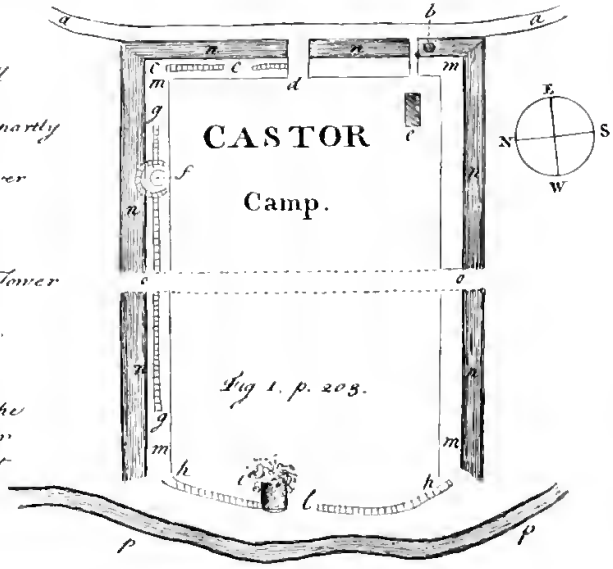


Fig 1. p. 203.

An Halo.

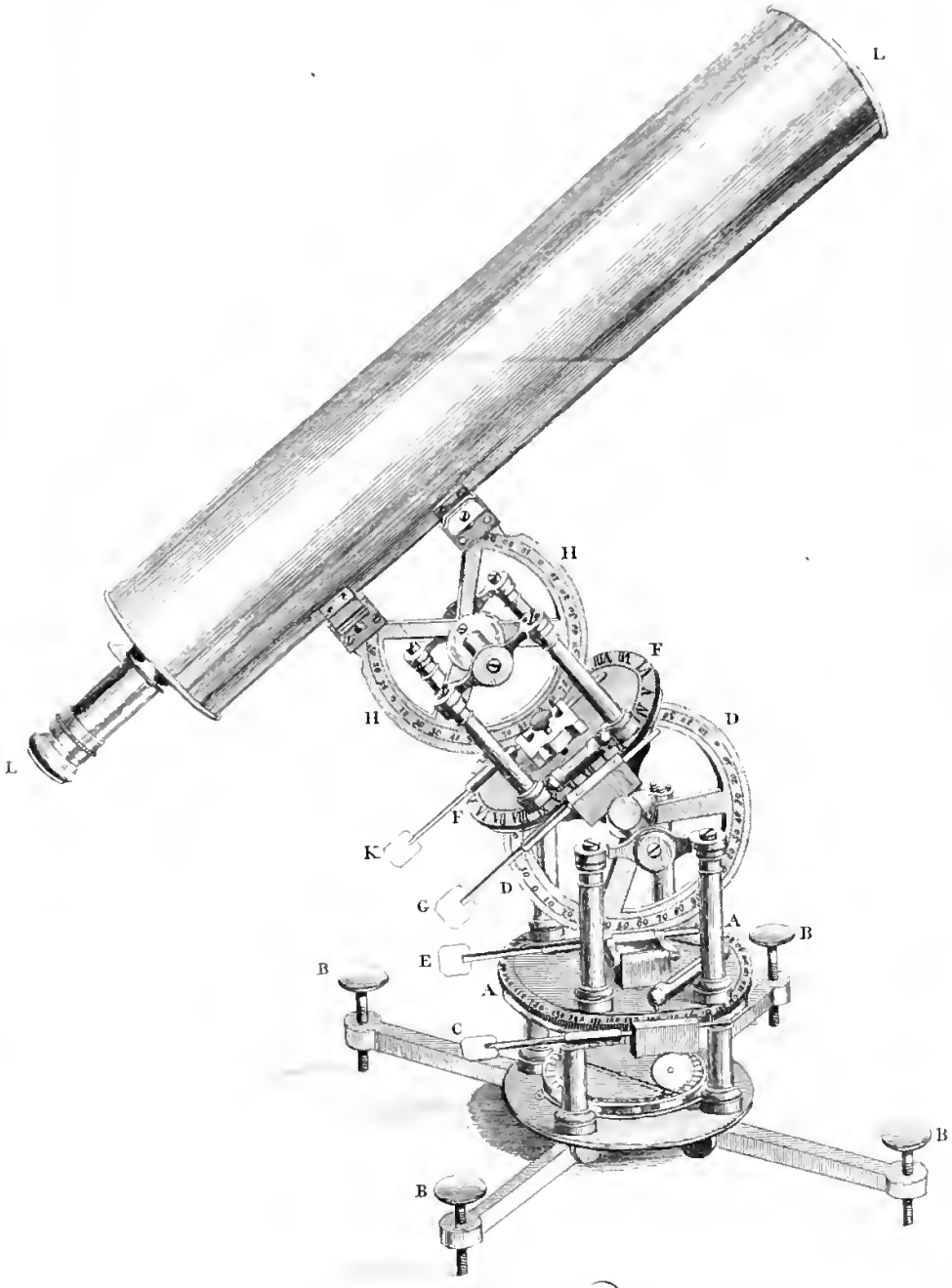
Fig. 2. p. 203.

A Section of the Rampart and Ditch as they are to be Seen at this Day.

J. Myndt. sc.

Inches 27 ½

W. Stukeley delin. Inches 23 ½ J. Hynd sc.



Equatorial Telescope

J. Mynde sculp.

Fig. 11. p. 262.

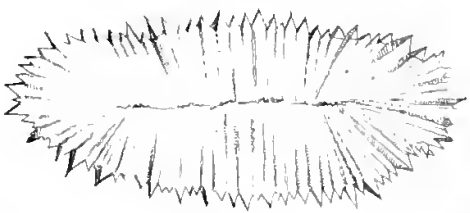


Fig. 1 p. 258

Fig. 20 p 278

Fig. 21. p. 279.

Fig. 12. p. 263.

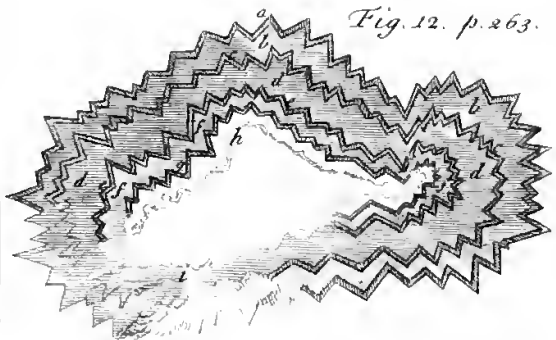


Fig. 8. p. 261. 271.

Fig. 6. p. 261.

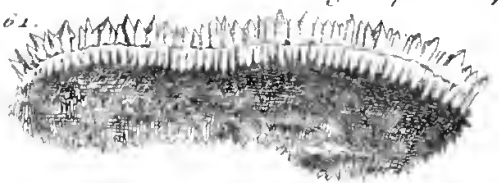


Fig. 7. p. 261.

Fig. 9. p. 262

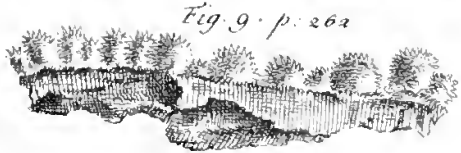


Fig. 14. p. 263.

Fig. 13. p. 263.

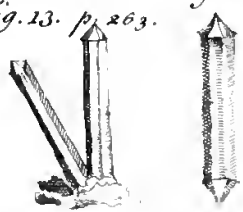


Fig. 15. p. 263.

Fig. 10. p. 262.

J. Mynde sc.

Philos. Trans. N° 493. TAB. V.

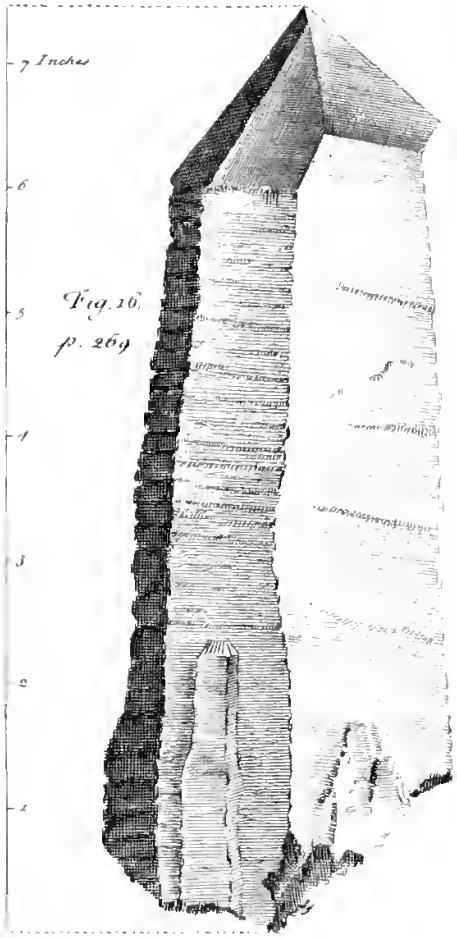


Fig. 16. p. 269

Fig. 22. p. 252.

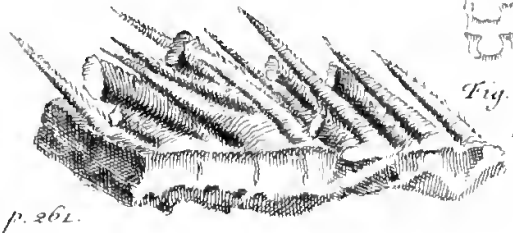


Fig. 3. p. 260.

Fig. 4. p. 261.

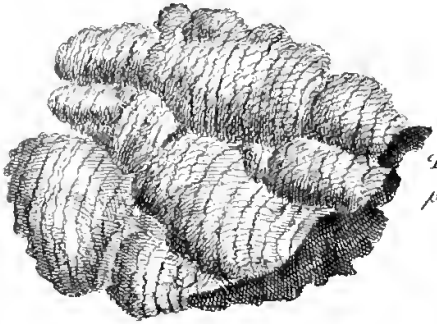


Fig. 2. p. 260.

Fig. 3. & Base of Fig. 4. p. 261.

Fig. 19. p. 277.

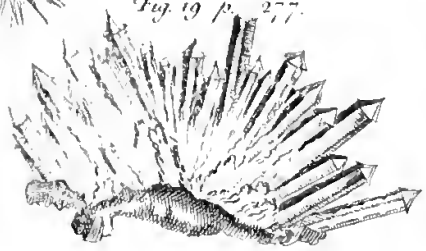


Fig. 17. p. 274.

Fig. 18. p. 277.

J. Mynde

Numb. 493.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *Octob. Nov.* and *Dec.* 1749.

I. *A Deſcription of an extraordinary* Rainbow *obſerved* July 15, 1748. *by* Peter Daval, *Eſq*; *Secret. R. S.* *p.* 193

II. *A Letter from Mr.* Henry Baker, *F. R. S. to the* Preſident, *containing an Extract of a Letter from Mr.* William Arderon, *F. R. S. to Mr.* Baker, *giving an Account of the preſent Condition of the* Roman Camp *at* Caſtor *in* Norfolk, *with a Plan of it*; *and alſo a Repreſentation of an* Halo *or* Mock-Sun *obſerved by the ſame Gentleman* July 11, 1749. *p.* 196

III. *Part of a Letter from* Leonard Euler, *Prof. Math. at* Berlin, *and F. R. S. To the Rev. Mr.* Caſpar Wetſtein, *Chaplain to his* Royal Highneſs *the Prince of* Wales, *concerning the gradual Approach of the* Earth *to the* Sun. *Tranſlated from the* French, *by T. S. M. D.* F. R. S. *p.* 203

IV.

IV. *Part of a Letter from Mr.* Benj. Cooke, *F. R. S. to Mr.* Peter Collinſon, *F. R. S. concerning the Effects of the Mixture of the* Farina *of* Apple-Trees; *and of the* Mayze *or* Indian Corn: *And of a Child born with the* Jaundice *upon it, received from its* Father; *and of the* Mother *taking the ſame Diſtemper from her Huſband, the next Time of being with Child. p.* 205

V. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to Mr.* Henry Baker, *F. R. S. concerning a very* cold Day, *and another a very* hot Day, *in* June *and* July 1749 *and of the near* Agreement *of* Thermometers *in* London *and at* Tooting. *p.* 208

VI. *Account of a Bas-relief of* Mithras *found at* York, *explain'd by the Rev. Dr.* Stukely, *F. R. S. communicated to the Royal Society, by Mr.* Francis Drake *of* York, *F. R. S. p.* 214

VII. *Part of a Letter from* James Mounſey, *M. D. Phyſician to the* Czarina's *Army, to Mr.* Henry Baker, *F. R. S. concerning the* Ruſſian Caſtor, *the Baths at* Carlſbad, *the*

the Salt-mines near Cracau, *and various other Notices.* *p.* 217

VIII. *The Caſe of a Lady, who was delivered of a Child, which had the* Small-Pox *appeared in a Day or two after its Birth; drawn up by* Cromwell Mortimer, *M. D. Secret. R. S.* *p.* 233

IX. *Some Accounts of the* Fœtus in utero *being differently affected by the Small Pox. By* W. Watſon, *F. R. S.* *p.* 235

X. *The Caſe of* Nicolas Reeks, *who was born with his* Feet turned inwards, *which came to rights after being ſome time uſed to ſit croſs-legged. Tranſmitted from* William Millner, *Eſq*; *at* Poole, *to Sir* Peter Thompſon, *Knt. F. R. S.* *p.* 239

XI. *A Letter from Mr.* James Short, *F. R. S. to the Preſident, with the* Deſcription *and* Uſes *of an* Equatorial Teleſcope. *p.* 241

XII. *An Eclipſe of the Moon, obſerved at Mr.* Graham's *in* Fleet-ſtreet, *by* John Bevis, *M. D. and Mr.* James Short, *F. R. S.* *p.* 247

XIII. *An Account of an extraordinary* Meteor *ſeen in the County of* Rutland, *which reſembled*

reſembled a Water-Spout, *communicated to the* Preſident *by* Tho. Barker, *Eſq*; *p.* 248

XIV. *An Enquiry into the original State and Properties of* Spar, *and* Sparry Productions, *particularly the* Spars *or* Cryſtals *found in the* Corniſh *Mines, called* Corniſh Diamonds. *In a Letter to* Emanuel Mendez da Coſta, *Eſq*; *F. R. S. from the Rev. Mr.* Wm. Borlace. *p.* 250

XV. *A Deſcription of the* Great Black Waſp, *from* Penſilvania, *as communicated from Mr.* John Bartram *to Mr.* Peter Collinſon, *F. R. S.* *p.* 278

XVI. *An Obſervation of an Eclipſe of the Moon,* Dec. 12. 1749. *made at* Earith, *near St.* Ives, *in* Huntingdonſhire, *by Mr.* Wm. Elſtobb, *jun. commuicated in a Letter to* Martin Folkes, *Eſq*; *Pr. R. S.* *p.* 280

XVII. *A Catalogue of the* Eclipſes *of* Jupiter's Satellites *for the Year* 1751. *by* James Hodgſon, *F.R.S. and Maſter of the Royal Mathematical School in* Chriſt's-Hoſpital, London. *p.* 282

XVIII. *A Letter from the Widow of the late Mr.* John Senex, *F. R. S. to the* Preſident, *concerning his large Globes.* *p.* 290

I. *A Deſcription of an extraordinary* Rainbow *obſerved* July 15, 1748. *by* Peter Daval, *Eſq*; *Sec. R. S.*

Read Oct. 26, 1749.

UPON *Monday* the 18th of *July* 1748. about a Quarter before Seven in the Evening, the Weather being temperate, and the Wind about N. N. W. as I was walking in the Fields, beyond *Iſlington*, I ſaw a diſtant Rainbow which appeared to take in a large Portion of the Heavens; but had nothing remarkable, and vaniſh'd by degrees.

Continuing my Walk, about twenty Minutes after the Diſappearing of the firſt Rainbow, a rainy Cloud croſs'd me, moving gently with the Wind, which exhibited to me a more perfect and diſtinct Rainbow, than I had ever before ſeen; wherein I could plainly diſtinguiſh all the ſecondary Orders of Colours taken Notice of by the late Dr. *Langwith* in his Letters to Dr. *Jurin* publiſhed in the Philoſophical Tranſactions*, that is, to ſay, within the Purple of the common Rainbow, there were Arches of the following Colours.

1. Yellowiſh Green, darker Green, Purple.
2. Green, Purple.
3. Green Purple.

---

* *Vid.* Phil. Tranſ. No. 375. from Page 241 to 245. Ab. Tranſ. (*Eames* and *Martin*) Vol. 6. p. 122, 123.

This innermoſt arch Dr. *Langwith* calls faint vaniſhing Purple, and I likewiſe found, that it ſometimes appear'd and diſappear'd alternately; but during about two Minutes it ſeem'd to me to be as permanent as any of the other Colours.

I ſtood ſtill, and look'd attentively at this Appearance, during the whole Time of its Continuance, which was near eight Minutes, and could for the greateſt Part of that Time diſcern all the above-mention'd Colours, except the innermoſt Purple in the upper Parts of the Bow; but could not diſtinguiſh any of them in thoſe Parts of it which were near the Horizon, tho' they were extremely vivid, as was likewiſe the outer Bow, in which the Colours appear'd as bright, tho' not ſo well defin'd, as in moſt inner Rainbows I had ſeen.

As I had read Dr. *Langwith*'s Letter a ſhort time before I ſaw this beautiful Appearance, and as I compared his Account with what I had ſeen, the ſame Evening, and again the next Morning, I can the better be aſſur'd of the exact Agreement of our Obſervations.

On my firſt ſeeing this Phænomenon, I was ſurpris'd, that the Diameter of the Bow appear'd to me very ſmall, compar'd with that I had ſeen a little before. The Occaſion of this I think muſt have been, that the Legs of the firſt-mention'd Bow appeared to me to terminate at diſtant Places: Whereas in the latter Appearance I could plainly ſee both Ends of the inner and outer Bows terminated in the neighbouring Fields, at a very ſmall Diſtance from each other: Hence, and from my being involv'd in the Shower which occaſion'd this Rainbow, I conclude

it

it was very near me; which might be one Cauſe of the great Vividneſs of its Colours, and of my diſtinguiſhing the inner Arches. But whether this was the only Cauſe of thoſe Appearances, or whether they might not be owing to ſome particular Diſpoſition of the Atmoſphere at that Time, I much queſtion: As well becauſe I have often ſeen Rainbows which have been very near me, and oppoſed to a bright Sun, wherein I could not diſcern theſe inner Orders of Colours, as that I have heard from ſome intelligent Perſons, that ſome very bright Rainbows were ſeen ſoon after the Solar Eclipſe which happened on the 14th of *July* 1748. particularly that an unuſually vivid and diſtinct Rainbow was obſerv'd at *Twickenham* three or four Days after that Eclipſe, which agrees with the Day on which I ſaw the above-mention'd Appearance.

II. *A Letter from Mr.* Henry Baker, *F. R. S. to the* Preſident, *containing an Extract of a Letter from Mr.* William Arderon, *F. R. S. to Mr.* Baker, *giving an Accont of the preſent Condition of the* Roman Camp *at* Caſtor *in* Norfolk, *with a Plan of it; and alſo a Repreſentation of an* Halo *or* Mock-Sun *obſerved by the ſame Gentleman* July 11, 1749.

SIR, *London, October 26, 1749.*

Read Nov. 2. 1749. I TAKE the Liberty to lay before you an Account lately ſent me by my ingenious Correſpondent Mr. *William Arderon, F. R. S.* of the preſent Condition of the *Roman* Camp at *Caſtor*, in the County of *Norfolk*, together with a Plan or Drawing of the ſame, taken by himſelf upon the Spot, in the Month of *June* laſt: At which Time he went thither on purpoſe to examine it. As this Camp is a remarkable Piece of *Roman* Antiquity, and I have always found Mr. *Arderon* extremely accurate in his Obſervations and Deſcriptions, they may I hope be thought deſerving your Notice. I take likewiſe this Opportunity of preſenting you the Account and Repreſentation of an *Halo*, or Mock-Sun, ſeen by the ſame diligent Obſerver on the 11th Day of *July* laſt.

Permit

Permit me, at the ſame Time the Honour of aſſuring you that I am with the greateſt Reſpect,

S I R,

Your moſt obedient humble Servant,

H. BAKER.

The Extract of a Letter from Mr. Arderon *to Mr.* Baker.

Dear Sir,

IN Conſequence of my Promiſe to you I have been at *Caſtor*, to view the preſent Condition of that celebrated *Roman* Camp, whoſe venerable Ruins appear there; and I now ſend you the beſt Deſcription of it my Obſervations can furniſh out. Indeed when I made ſuch Promiſe, I little thought how difficult a Task I had undertaken, and how eaſily the moſt skilful in theſe Matters may be miſtaken, amidſt ruinous Heaps and Veſtigia nearly effaced by Length of Time. However, I can aſſure you, no Care or Caution has been wanting, and the plain Truth ſhall be related with all the Exactneſs poſſible.

The Town of *Caſtor* is at preſent in a very low Condition, containing no more than between twenty and thirty ſmall Cottages. It ſtands about four Miles South-weſt of *Norwich*, and by Tradition, and ſome learned Authors, is ſuppoſed to have been a conſiderable City, out of whoſe Ruins *Norwich* took its Riſe. *Skinner* ſays, in his Etymologicon, "*Caſtor* "*in Com. Norf. olim VENTA ICENORUM:* "*ex cujus Ruinis orta eſt Norwich civitas.*" However, at this Day (excepting the Camp) not the leaſt Trace or Footſtep of any-thing remarkable is left remaining.

The

The Camp itſelf lies near a Furlong South-weſt from the Town of *Caſtor*, and leads you by a gentle Deſcent down to the little River *Wentſum*, which ſwiftly glides cloſe to the End thereof, and no Doubt, at the firſt forming of the Camp was deſigned to be Part of the Fortification on that Side, as well as to ſupply the Army with Water, and to bring up ſuch Things as they wanted from the Sea, if ſo be their Communication by Land ſhould at any Time be impeded. What confirms me in this Opinion, is a large Staple and Ring of Iron, which I myſelf have ſeen on the Side of the Tower that ſtands near the River; tho' now I find that curious Monument of Antiquity is taken away. However, on my Suppoſition, this River muſt have been much larger at that Time than it is at preſent, or it could have been of little Uſe for Water-carriage, from the Smallneſs and Shallowneſs of its Stream.

This River by ſome is called *Taus*, or *Teſe*: But I imagine it did not formerly take that Name until it approached the *Roman* Camp at *Teſeburgh*, three or four Miles higher.

We are told by Tradition, as well as by ſome learned Authors, that the Sea came up to this Camp; and indeed every intelligent Obſerver muſt confeſs, that the Marine Bodies found in every Part of *Norfolk*, on the higheſt Hills, as well as in the loweſt Pits and Valleys, are indubitable Proofs, that at ſome Time or other the Sea muſt have covered this whole County: But then we may be aſſured, by the preſent Condition of this Camp, that the Sea hath not exceeded the Level of it ſince it hath been in Being, which, if we credit ſeveral of our antient Hiſtorians, it was upwards

wards of 1700 Years ago. It may therefore ſerve to prove, that the Sea ſince that Time has not exceeded theſe Bounds, and that the Foſſils dug up above this Level are more antient than it, tho' we have no proper *Data* to diſcover how long before, the Sea had paſſed this Height.

I have been pretty exact in examining the Situation of this Camp, imagining the two Sides had pointed due Eaſt and Weſt, and the two Ends North and South: But I find they differ from it full ten Degrees, after allowing for the Variation of the Needle: Whence it is plain the Meridian of the Place muſt have altered better than half a Degree each Century to the Weſtward, provided the Situation of the Camp was placed due North and South when it was firſt formed. But poſſibly the *Romans* might not be exact as to the Points of the Compaſs, or perhaps this Variation was at firſt diſpenſed with to accommodate the Camp to the natural Declivity of the Ground. Theſe Difficulties however may better be cleared up, if ſome ingenious Gentlemen would take the Trouble to examine ſome other *Roman* Camps in different Parts of this Kingdom, to diſcover whether the *Romans* paid a ſtrict Regard to the diſpoſing of their Camps with their Sides to the four cardinal Points of the Compaſs, which I think it will nearly amount to a Demonſtration that they did, if they are found to agree with this Camp at *Caſtor* in its Variation from due North and South.

The Figure of the Camp is not a Square (as it is deſcribed by moſt Authors who have writ upon it) but a Parallelogram, whoſe two longeſt Sides are each 440 Yards, and its Ends or two ſhorter Sides

360 Yards each. Theſe are its Dimenſions without-ſide the Rampart and Ditch; but within-ſide the ſaid Ditch and Rampart the Length is 392 Yards, and the Breadth 264. I meaſured the Breadth of the Foſſe and Rampart, which I found in ſome Places, where it remains moſt perfect, to be 48 Yards, tho' in others not above 30. And according to my Computation the whole Ground taken up, including the Ditch and Rampart, is 32 Acres, 2 Rood, and 36 Pole; or the Area within the Ditch and Rampart 21 Acres, 1 Rood, 21 Pole.

At about three or four Furlongs North-weſt of the Camp riſes a Ridge of Hills, appearing ſomething like a ſecond Rampart, and deſcending gradually to the Camp. Theſe Hills add greatly to the Proſpect, and muſt have been no little Advantage to the Safety of the Place, as a conſtant Watch might be kept thereon to prevent any Surprize; nor could an Enemy advance nearer than the Summit of theſe Hills without being expoſed to the View of the whole Camp.

Three Sides only of this Camp have been fortified with a Rampart, whoſe upper Part was faced with a thick and ſtrong Wall made of Lime and Flints, of which Wall there are ſtill Remains in ſeveral Places of the Rampart, beſides a very deep Ditch that ſeems to have been moſt conſiderable on the Eaſt and South Sides.

The Wall on the North Side appears to have been built at two different Times; that is, it ſeems to have been raiſed higher than it was built at firſt, at ſome Diſtance of Time afterwards; for a Parting may be obſerved at a certain Height running from End to End.

The

The Ruins of two old Towers ſtill remain, one of which ſtood on the North Side, and the other at the Weſt End; the laſt of which is at preſent the moſt conſiderable of the two. They were both built in a manner perhaps peculiar to the *Romans* at that Time, and which it may not be improper to deſcribe. They began firſt with a Layer of Bricks laid flat as in Pavements; on that they placed a Layer of Clay and Marle mixed together, and of the ſame Thickneſs as the Bricks; then a Layer of Bricks, afterwards of Clay and Marle, then of Bricks again, making in the whole three Layers of Bricks and two of Clay: Over this were placed Bricks and Lime 29 Inches, the Outſide being faced with Bricks cut in Squares (like the modern Way of Building in ſome Parts of *Norfolk*), then Bricks and Clay again *Stratum ſuper Stratum*, as high as the old Ruins now remain ſtanding.

The Mortar is found extreamly hard at this Day: It is a Compoſition of Lime, Sand, and Aſhes, and ſo compact that I could by no Means break a Piece of it of an Inch Diameter from the Baſe of one of the Towers at the Eaſt Gate, but on ſtriking it with a ſharp Flint it flew off in Duſt.

The *Roman* Bricks which I examined, were made of two different Sorts of Clay mixt; when burnt one appears red and the other white: At the Time of my viewing them they were exceeding hard and ſolid, and far ſuperior to any thing of the Kind now made with us. Perhaps they are little worſe than when they were firſt laid down.

Theſe Bricks were made without the Aſſiſtance or Addition of Sand, as is too much the Practice at

preſent here in *Norfolk* : For when Sand enters the Compoſition in any conſiderable Proportion, it renders the Bricks friable, ſoft, and rotten, ſubject to be broke or ground to Pieces with the leaſt Motion or Preſſure.

I took the exact Dimenſions of ſeveral of theſe Bricks, and found their Length to be 17 $\frac{4}{10}$ Inches, or a *Roman* Foot and Half; and their Breadth 11 $\frac{6}{10}$ Inches, or preciſely a *Roman* Foot : which I think may ſerve as ſome Proof that the *Roman* Meaſures handed down to us by ſeveral Authors are right, and may likewiſe inform us of the proportionable Stature of Man at that Time. The Thickneſs of theſe Bricks is 1 $\frac{3}{10}$ Inch.

The great Number of *Roman* Medals that have been, and are ſtill found in and about this Camp, are to me a Matter of great Wonder. One Lady who lives near the Place, has (I am credibly informed) picked up at leaſt an hundred with her own Hands, and ſeveral are daily gathered up by Boys, and ſold to Strangers who come to viſit the Place.

That theſe Pieces have been uſed as Money I think exceeding clear, from their different Degrees of Perfection, ſome being worn almoſt quite ſmooth, others having imperfect Buſts without Letters, and others again having both the Buſts and Inſcriptions fair and legible, which could not happen, I think, but from their different Wear as Money. But then how ſuch Quantities of them ſhould become ſcattered, as if ſown, in this and other *Roman* Stations, is a Difficulty I muſt leave to thoſe better verſed in theſe Matters to reſolve.

I ſend

I ſend herewith a Plan of the Camp in its preſent Condition, [TAB. I. *Fig.* 1.] that my Deſcription may the better be underſtood; and I ſend along with it the Appearance of a particular kind of Halo, which was obſerv'd at *Norwich*, on the 11th of *July* laſt, at 5 o'Clock in the Evening; the Colours were exceeding vivid, and the Centre of it, contrary to what I ever yet ſaw, was not in the Sun, but in the Zenith.

The Sun's Rays ſhone through the Clouds at the ſame time, as they frequently do when the Sun is near the Horizon. In ſhort, the Drawing [TAB. I. *Fig.* 2.] which repreſents the Whole, makes any farther Deſcription of it needleſs; and I ſhall only add, that I am,

Dear Sir,

Your moſt humble Servant,

Norwich, Aug. 28. 1749.

William Arderon.

III. *Part of a Letter from* Leonard Euler, *Prof. Math. at* Berlin, *and F. R. S. To the Rev. Mr.* Caſpar Wetſtein, *Chaplain to his* Royal Highneſs *the Prince of* Wales, *concerning the gradual Approach of the* Earth *to the* Sun. *Tranſlated from the* French, *by S. T. M. D.* F. R. S.

Berlin, June 28. 1749.

Read Nov. 2. 1749.

MOnſieur *le Monnier* writes to me, that there is, at *Leyden*, an *Arabic* Manuſcript of *Ibn jounis* (if I am not miſtaken

in the Name, for it is not diſtinctly wrote in the Letter), which contains a Hiſtory of Aſtronomical Obſervations. M. *le Monnier* ſays, That he inſiſted ſtrongly on publiſhing a good Tranſlation of that Book. And as ſuch a Work would contribute much to the Improvement of Aſtronomy, I ſhou'd be glad to ſee it publiſh'd. I am very impatient to ſee ſuch a Work which contains Obſervations, that are not ſo old as thoſe recorded by *Ptolemy*. For having carefully examined the modern Obſervations of the Sun with thoſe of ſome Centuries paſt, although I have not gone farther back than the fifteenth Century, in which I have found *Walther*'s Obſervations made at *Nuremberg*; yet I have obſerved that the Motion of the Sun (or of the Earth) is ſenſibly accelerated ſince that Time; ſo that the Years are ſhorter at preſent than formerly: The Reaſon of which is very natural; for if the Earth, in its Motion, ſuffers ſome little Reſiſtance (which cannot be doubted, ſince the Space through which the Planets move, is neceſſarily full of ſome ſubtile Matter, were it no other than that of Light) the Effect of this Reſiſtance will gradually bring the Planets nearer and nearer the Sun; and as their Orbits thereby become leſs, their periodical Times will alſo be diminiſh'd. Thus in Time the Earth ought to come within the Region of *Venus*, and in fine into that of *Mercury*, where it would neceſſarily be burnt. Hence it is manifeſt, that the Syſtem of the Planets cannot laſt for ever in its (preſent) State. It alſo inconteſtably follows, that this Syſtem muſt have had a Beginning: For whoever denies it, muſt grant me, that there was a Time, when the Earth was at the Diſtance

Diſtance of *Saturn*, and even farther; and conſequently that no living Creature could ſubſiſt there. Nay there muſt have been a Time, when the Planets were nearer to ſome fixt Stars than to the Sun; and in this Caſe they could never come into the Solar Syſtem. This then is a Proof, purely phyſical, that the World, in its preſent State, muſt have had a Beginning, and muſt have an End. In order to improve this Notion, and to find with Exactitude, how much the Years become ſhorter in each Century; I am in Hopes that a great Number of older Obſervations will afford me the neceſſary Succours.

I beg you will preſent my Reſpects to the Royal Society; and am,

Yours, &c. L. Euler.

IV. *Part of a Letter from Mr.* Benj Cooke, *F. R. S. to Mr.* Peter Collinſon, *F. R. S. concerning the Effects of the Mixture of the* Farina *of* Apple-Trees; *and of the* Mayze *or* Indian Corn: *And of a Child born with the* Jaundice *upon it, received from its* Father; *and of the* Mother *taking the ſame Diſtemper from her Huſband, the next Time of being with Child.*

Read Nov. 2. 1749.

WHEN the Farina of one Apple impregnates another's Bloſſom of differing Species, we ſee the Change in * the Fruit; but whether any laſting Impreſſion is left on the Bough

* See theſe Tranſactions No. 490. p. 622.

Bough which bore it (as ſeems to be in Tulips and ſome other Flowers), is not ſo eaſy to determine, Experiments of this ſort being not to be made at all, but catch'd at diſtant Opportunities; and till this Point is ſettled, the Diſtemper of my good Friend's Tree muſt reſt unexplained.

Artificial Helps of Sight have added to former Diſcoveries the exploſive Manner of the *Farina's* Action; but what may be the Effect of the inconceiveably fine ſubtile Matter emitted from its Globules, and continually waſted about in great Plenty and Variety in the Summer Air, not only on vegetable Productions (where on different Subjects it may not improbably have oppoſite Effects) but other Matters not yet ſuſpected to be ſo much under its Influence, remains a Field of Inquiry for future Ages.——However, to what Mr. *Logan* hath very juſtly obſerved (*Tranſact.* 440.) on the Manner of Impregnation of the Seeds in Mayze—I can add this, that if the Seed and whole Species of Mayze be planted about two Yards Diſtance from each other, there will be a Mixture of red and white Grains in the Ears of each Plant, and you may with Pleaſure obſerve the Filament in the white Plant, which hath been ſtruck with the red Farina, diſcovering its alien Commerce by a conſcious Bluſh, and by counting the Threads they ſtained, foretell how many correſponding Seeds will appear red, at the opening of the Ear, when ripe.

A MAN of about 22 Years married a healthy young Woman, much of the ſame Age.—Soon after he went to *America*, and at the End of ſeven Years returned cachectic, anaſarcous, and deeply tinged with

with the Jaundice, endemical in hot Latitudes.— In a few Months after his Return his Wife became pregnant (with her firſt Child) of which ſhe was delivered in due Time. The Child was born with a Jaundice upon it, and died about ſix Months after, under aſcitical and icterical Symptoms, of which the Mother had not the leaſt Impreſſion.——Soon after this (and before the Husband, tho' much better, was quite cured) ſhe became again with Child, and after about three Months Pregnancy turn'd yellow, and was the whole Time of her going with Child, and ſome Months after her Delivery, deeply affected with the Jaundice: But the Child was born quite fair, white, and healthy, without any thing of that Diſtemper on it; and is ſtill living, and the laſt born, ——I make no Application——You muſt impute this Length of your Trouble to the wet Weather. I am moſt ſincerely,

Dear Couſin,

Your moſt obliged

And moſt affectionate

B. Cooke.

V. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to Mr.* Henry Baker, *F. R. S. concerning a very* cold Day, *and another a very* hot Day, *in* June *and* July 1749 *and of the near* Agreement *of* Thermometers *in* London *and at* Tooting.

Read Nov. 16. 1749.

I Now fulfil my Promiſe made to you ſome time ago, in ſending you an Account of the two Days which were ſo remarkable, the one for Cold, the other for Heat, this laſt Summer.

On the 10th of *June*, ſuſpecting a Froſt that Night, I ſat a *China* Saucer full of Water upon the Graſs-plot, in the Garden; and the next Morning, a little before Sun-riſing, I found the Water frozen over, of ſuch a Conſiſtence, as that I forced a Hole thro' the Centre of it with my Finger, without breaking it elſewhere, and carried the Cake of Ice into the Houſe, where it remained a good While not diſſolved. Wind was N. W On ſome following Days there were ſeveral conſiderable Froſts, the Wind continuing the ſame way; the fatal Effects of which are ſufficiently known throughout the Kingdom.

July 2d, at 12^h 20′ my Thermometer of *Farenheit's* Scale, in the ſhaded Air, ſtood at 88—, and at 2^h *p. m.* at 87. At which laſt Number two others of the ſame ſort ſtood exactly, at that Hour, in *London*.

Having agreed with my ingenious Friend Mr. *John Canton* of *Spital-Square*, to make Obſervations of the

the Temperature of the Air here, and in *London*, at a ſtated Hour : We procured Thermometers, made exactly alike, by that accurate Workman Mr. *Bird* ; and having found, by hanging them firſt together a ſufficient Time, that they perfectly agreed, we began our Obſervations in *April*, and have continued them ever ſince.

The Thermometers are of the ſmaller Size, the Bulbs being but about $\frac{47}{100}$ of an Inch Diameter, and are immediately affected with any Mutations of the Air; ſo that I have frequently been entertained with obſerving, in ſome Circumſtances of the Weather, that the Mercury has not been ſtationary, but has ſucceſſively riſen and fallen for a good While; and Mr. *Canton* has informed me, that he has ſeveral times obſerv'd the ſame.

I have annexed a Paper, containing an Extract from my Journal of the Weather, in which I have ſet down the Extremes of the Barometer and Thermometer, obſerved at 2^{h} *p. m.* for Six Months; and Mr. *Canton* has been ſo kind as to communicate a like Extract from his Journal; which is likewiſe put into your Hands.

It appears by a more general Compariſon which we have made, as well as by this particular one, that the Difference in the Temperature of the Air, as to Heat and Cold, is very little between this Place and *Spital-Square*. Sometimes my Thermometer has been higher than his; more times upon an Equality, but moſt times lower—And I have Reaſon to think the Difference, many times, may have been owing to accidental Cauſes : For Mr. *Canton* has informed me, that he has found two Thermometers,

when removed but a few Yards from each other, have differed 2 or 3 Deg. for which no apparent Cauſe could be aſſigned. So that upon the whole, it may reaſonably enough be concluded, that the Difference between the Temperature of the Air in the two Places, is imperceptible to Senſe. I am,

Dear Sir,

Tooting, Nov. 13. 1749. *Your, and the Royal Society's Moſt obedient humble Servant*

H. Miles.

P. S.

Upon my having obſerved that the Days, in which my Thermometer and Mr. *Canton*'s ſtood at the Extremes, in ſome Months did not coincide, I was deſirous of knowing, how much the Thermometers differed, when the Extremes did not happen on the ſame Day: But, upon a Compariſon, the Difference was never conſiderable, except on the 4th *Aug.* at 2. *p. m.* when my Thermometer was about 6 Degrees higher than Mr. *Canton*'s. This being ſomewhat remarkable, he, upon hearing it, had Recourſe to his Regiſter, and found, that at the Time of Obſervation a heavy Shower of Rain fell; whereas we had none here: But about Six in the Evening came on a Thunder Shower attended with Rain; ſo that it ſhould ſeem the falling Rain had ſo great an Effect upon the Air as to render it cooler, by the Degrees mentioned: And perhaps the Difference between the two Inſtruments, at other Times, may have been owing to the ſame, or a ſimilar Cauſe, rather than to a *ſtated* different Temperature of the Air, in the two Places.

EX-

EXTRACT *from a Journal of the Weather, made at* Tooting, *in* Surry, *in which the Extremes of the Barometer and Thermometer are noted at* 2 h p. m. *equal Time, for the Months of* May, June, July, Auguſt, September, *and* October, *this preſent Year* 1749.

MAY. 1749.			
Day	Bar.	Day	Ther.
14	higheſt 30, 04	17	higheſt 76
Day	Bar.	Day	Ther.
24	loweſt 29,15	3	loweſt 50

JUNE. 1749.			
Day	Bar.	Day	Ther.
8	higheſt 30, 10	28	higheſt 79
Day	Bar.	Day	Ther.
17	loweſt 29, 25	3	loweſt 46

JULY. 1749.			
Day	Bar.	Day	Ther.
8	higheſt 29, 95	2	higheſt 87 *
Day	Bar.	Day	Ther.
20 22	loweſt 29, 44	30	loweſt 62½

AUGUST. 1749.			
Day	Bar.	Day	Ther.
15	higheſt 30, 02	22	higheſt †
Day	Bar.	Day	Ther.
2	loweſt 29, 20	31	loweſt 62½

SEPTEMB. 1749.			
Day	Bar.	Day	Ther.
26	higheſt 30, 37	5	higheſt 71
Day	Bar.	Day	Ther.
17	loweſt 29, 3	12	loweſt 53

OCTOB. 1749.			
Day	Bar.	Day	Ther.
10	higheſt 30, 44	4 7	higheſt 61½
Day	Bar.	Dy	Ther.
28	loweſt 29, 51	27	loweſt 43

† Being abſent *Aug.* 22d, at 2 *p. m.* I could not

 obſerve

obſerve the State of the Thermometer; but am well ſatisfied that Day was the hotteſt in the Month, from the Obſervation I made at other Times of the Day, and particularly from the Account I had from my Friend Mr. *Canton*, of the State of his, which ſtood at $80\frac{1}{2}$ at 2. *p. m.*

It may be proper to obſerve, that the Barometer made uſe of ſtands $\frac{3}{10}$, or more, lower than others of the ſame Conſtruction (which is the common upright Make) during the warmer Seaſon of the Year, and uſually as much higher than they do in the colder; but is made uſe of (as it has been for more than 10 Years) becauſe I have always found it to riſe and fall ſooner than any other I have compared it with, and in particular than a very good one, made by the late Mr. *Siſſon*, which has always hung by it, and is conſtantly compared therewith.

EXTRACT *from a Journal of Obſervations on the* Barometer *and* Thermometer, *made in* Spital Square, London, *in which the Extremes of each are noted, at* 2 ʰ p. m, *equal Time, for the Months of* May, June, July, Auguſt, September, *and* October, *this preſent Year* 1749.

MAY. 1749.

Day	Bar	Day	Ther.
13	higheſt 33, 23	13	higheſt 76½
Day	Bar.	Day	Ther.
25	loweſt 29, 33	4	loweſt 59

JUNE. 1749.

Day	Bar.	Day	Ther.
27	higheſt 30, 32	28	higheſt 80
Day	Bar.	Day	Ther.
17	loweſt 29, 30	3	loweſt 48½

JULY. 1749.

Day	Bar.	Day	Ther.
8	higheſt 30, 55	2	higheſt 87
Day	Bar.	Day	Ther.
24	loweſt 22, 66	18.30 31	loweſt 64½

AUGUST 1749.

Day	Bar.	Day	Ther.
15	higheſt 30, 25	22	higheſt 80½
Day	Bar.	Day	Ther.
2	loweſt 29, 41	4	loweſt 59½

SEPT. 1749.

Day	Bar.	Day	Ther.
26	higheſt 30, 44	5	higheſt 70½
Day	Bar.	Day	Ther.
17	loweſt 29, 87	2	loweſt 54½

OCTOB. 1749.

Day	Bar.	Day	Ther.
10	higheſt 30, 49	7	higheſt 61
Day	Bar.	Day	Ther.
28	loweſt 29, 43	27	loweſt 43

VI. *Account of a Bas-relief of* Mithras *found at* York, *explain'd by the Rev. Dr.* Stukely, *F. R. S. communicated to the Royal Society, by Mr.* Francis Drake *of* York, *Antiquary and F. R. S.*

York, October 25, 1749.

Read Nov. 23. 1749.

AS *York* was undoubtedly the *Roman*, Imperial City of *Britain:* So is it ſtill, caſually throwing up Remains of its antient Grandeur and Magnificence: Even down to our Time. About two Years ago, in digging the Foundation of a large Houſe, ſince built, in our *Trans Tyberim Street*, called *Micklegate*, *quaſi Muckle*, or *Great Street*, the Workmen went much below any former Foundation that could be obſerved on this Spot. And at the Depth of ten Feet, came to a Stone, which upon taking up, appeared to have Figures upon it, but miſerably defaced. Upon my viewing of it ſoon after, I confeſs, I was at a Loſs what to make of it; but judged it ſome Repreſentation of an Heathen Sacrifice, or Game, and therefore ſent as juſt a Drawing of it, as could be taken, to my very learned Friend Dr. *Stukely*, who according to his deep Knowledge in the Learning of the Antients, ſoon after returned me the following ſhort, but curious Explanation of this uncommon Piece of Sculpture.

" The Drawing (ſee *Tab.* II.) you ſent me, of the " Bas-relief, dug up in a Cellar in *Micklegate*, *anno* " 1747. is a great Curioſity. 'Tis a Sculpture of *Mi-* " *thras*, as uſual, ſacrificing a Bull. He has on, the " *Perſian* Mantle, called *Candys*, and the *Phrygian* " Bonnet,

" Bonnet, called *Tyara*. He repreſents the *Archi-*
" *magus*, performing the great annual Sacrifice, at
" the Spring Equinox: According to the Patriarchal
" Uſage.

" Theſe Ceremonies to *Mithras*, were generally
" celebrated in a Cave of a Rock; therefore, this
" Sculpture was found ſo deep in the Earth."

There is, commonly a Figure on each Side of him, habited in the ſame manner, ſtanding croſs-legg'd: The one holds a Torch up, the other down: Here is only the latter, in your Sculpture; the other is imperfect.

' Underneath, is the Figure of an Horſe, inti-
' mating thereby, the Sun's Courſe: For in time,
' when the old patriarchal Cuſtoms became profaned
' and deſecrated into Idolatry; they made *Mithras*
' to be the *Apollo*, or the Sun. Whence theſe
' Sculptures had a Number of Symbols, relating to
' the ſolar Circuit of the Year, thro' the twelve Zo-
' diacal Conſtellations.

' The two Figures attending on the *Archimagus*,
' are inferior Officers to him. There is a Myſtery
' in their ſtanding croſs-legg'd, like our Effigies of
' Croiſaders in Churches, and it means the ſame
' thing: For the Croſs was one Part of the *Mithriac*
' Ceremonies. Theſe two, by the different Attitude
' of their Torches, repreſent Day, and Night, as
' *Mithras* repreſents the Sun. The Figure imper-
' fectly drawn, at the Tail of the Horſe, is I believe,
' a Genius, twiſted round with a Snake; which
' means the Vitality, imparted to all Things, by the
' ſolar Power, and Circle.

The

'The other Figures are too imperfect, to trouble 'you with Conjectures about them; but they all 'regard the ſame Deſign. They are officiating 'Prieſts, and dreſt in ſuch a ſymbolic manner, as 'intimates the Sun's Influence, and annual Motion.

'The *Mithriac* Ceremonies, as likewiſe the My- 'ſteries of the Antients, were but the expiring Re- 'mains of the antient, patriarchal Religion; and 'Worſhip of the true God: As it were, ſwallowed 'up by Paganiſm, and the Devil's Inventions. For 'indeed the Patriarchal Religion was no other than 'Chriſtianity antedated.

'For in the *Mithriac* Ceremonies, and Myſteries, 'they had plainly, the two Chriſtian Sacraments: 'Initiation by Baptiſm: And the ſublime Commu- 'nion by Bread, and Wine. *Mithras* is but another 'Name of a *Meſſiah*, in his prieſtly Character: It 'ſignifies Mediator.

'Thus writes *Tertullian*, c. 40. ſpeaking of the 'Devil perverting the Rites of true Religion: "(He), "the Devil perſuades thoſe that are initiated into the "*Mithriac* Ceremonies, to believe an Expiation of "their Sins by their being baptized: And they are "croſſed on the Forehead, as his faithful Soldiers. "And likewiſe they there celebrate the breaking of "Bread." But they did not take theſe Ceremonies 'from the Chriſtians; they are of a much antienter 'Date; perhaps from the Beginning of the World.

'The *Romans* became extremely fond of the '*Mithriac* Sacreds, whence here you find this Sculp- 'ture in the Imperial City. I ſaw an Image of '*Mithras* at *Cheſter*, and no Doubt there are many 'more in *Britain*, either deſtroy'd, or undiſcover'd.

"St.

" St. *Jerom*, in his Epiſtle to *Læta*, writes, A " few Years ago, your Cozen *Gracchus*, a Name of " *Patrician* Quality, when he was Præfect of the " City, deſtroy'd, broke, and burnt the Cave of *Mi-* " *thras*." This was at *Rome*, and about the Year 378. Not long after, we may well imagine, your *Roman* Præfect of *York* followed his Example, and demoliſhed the ſubterranean Temple in *Micklegate*; where this Sculpture of him was found.

Stamford, July 30, 1747. WM. STUKELEY.

VII. *Part of a Letter from* James Mounſey, *M. D. Phyſician to the* Czarina's *Army, to Mr.* Henry Baker, *F. R. S. concerning the* Ruſſia Caſtor, *the Baths at* Carlſbad, *the Salt-mines near* Cracau, *and various other Notices.*

Dear Sir, *Riga, July* 1, 1749.

Read Nov. 23. 1749. I AM highly ſenſible of the Honour the Royal Society does me, in taking Notice of what I communicated to you, and only wiſh I were as capable as I am zealous to contribute any thing that might be ſatisfactory and acceptable to that illuſtrious Body, for which I have the greateſt Veneration.

I cannot as yet perfectly anſwer your Enquiries concerning the *Ruſſia* Caſtor which is not all from the ſame Animal, ſome of it being the *Proſtatæ*, *Teſtes*, and Kidneys of the Beaver, gathered in the Spring; but the true Sort comes from quite a different

Creature, which reſembles a wild Goat, juſt by whoſe Navel the Caſtor is found like two Glands. This I am aſſured from People who have ſeen it on the Spot; but as they are quite unacquainted with natural Hiſtory and Anatomy, we muſt not truſt to them too much: I hope ſoon however to procure an Account that may be depended on. In the mean time, as you encourage me to write to you freely, I will inform you of what I judged the moſt remarkable in the Courſe of my laſt Journey.

The Kingdom of *Bohemia* is a fine fertile Country, rich in Metals and Minerals of all Sorts. The Frontiers all round are very high Mountains: The inward Parts of the Country are hilly, with Plains and riſing Grounds intermixt, that have the Appearance of being the remaining Baſes and Ruins of former Mountains, the Soil being a Compoſition of decayed Rocks mixed with ſome vegetable Earth. The Rocks on the higheſt Mountains are an aggregate Stone of *Lapides Calcarii, Spati, Quartzi, Micæ, &c.* The Plains are covered with the leaſt diſſolvable Parts of ſuch Rocks. Their fineſt Cryſtals, and precious Stones, are gathered behind the Plough; many ſtill retaining the ſame Figures they had received at their Formation in the Veins and Hollows of the Rocks. I found on the Tops of Mountains decaying Rocks, which, when mixed with a little vegetable Earth, made exactly the ſame Soil with that in the riſing Grounds and Plains below.

There are ſeveral Places in this Kingdom where the Mountains are wholly of *Lapis Sciſſilis*, which breaks into Rhomboids; and I obſerved for many Miles the Shelves of this Stone running through different

different Mountains in the ſame Direction, facing the South-eaſt, with an Inclination of the Shelves of about 35 Degrees. The Soil here in the Plains is clayey.

Not far from the Frontiers of *Saxony*, in the Mountains, are the famous hot Springs of *Carlsbad*, the Tin-mines of *Schlachtenwald*, and Mines of *Pyrites*, where they prepare Sulphur and Vitriol. As I ſend you Specimens of the Minerals I met with in theſe Places, I ſhall give you alſo the beſt Account I can of what belongs to their Production.

Of the hot Springs at Carlsbad.

CARLSBAD is a ſmall Town, ſituated in an Hollow between two high Mountains: A ſmall River called *Toeple* runs through it from S. E. to N. W. The principal Fountain riſes on the North-eaſt Side, about twenty Paces from the River, and about five or ſix Feet higher than the Surface of the Water. This Spring riſes through a ſquare Tube of Wood, whoſe Diameter is about ſeven Inches, with a conſiderable Degree of Violence: Whence it is called the *Sproudle*, or *Furious Fountain*. It comes from the Mountain on the other Side, and paſſes underneath the River, where the petrifying Quality of its own Water has formed for itſelf an Aqueduct of *Tophus*, through which it is conducted to this Place. Sometimes this Aqueduct is ſo filled and choaked up with the *Tophus*, that it burſts into the River, and puts the Inhabitants to a conſiderable Expence for repairing it. But to prevent this, they bore and clean it every Year near the Fountain. It

forms Rocks of *Tophus* along the Rive-ſide, compoſed of *Strata* of ſeveral Colours, according as the Water has been impregnated with different Matter, or perhaps from the Difference of Heat or Cold, or the Impreſſions of the Air at the times of forming the *Lamellæ*. This *Tophus* is hard, and receives a good Poliſh, and of it they make Snuff boxes, Heads of Canes, and other Toys. Some Years ago, in digging to lay the Foundation of a Church, forty or fifty Paces higher up the Hill, they found vaſt Quantities of this *Tophus*, which was in many Places ſo decayed and rotten (reſembling very ſoft Clay), that they were obliged to dig ſeveral Fathoms deep, before they could find a ſolid Foundation. Here they threw out great Quantities of the *Piſolithus*, of the Kinds I ſend you, which are compoſed of the ſame Matter as the *Tophus*, though of a very different Conſtruction: The *Tophus* being made up of Plains joined together, whereas the *Piſolithi* are globular, and compoſed of ſeveral ſpherical Shells. Some Globules are found above an Inch in Diameter, but more commonly about the Bigneſs of white Peas, and decreaſing gradually in Size till they become as ſmall as fine Sand, and at laſt common *Tophus*.

The ſeveral Shells which compoſe theſe Globules differ in Colour as the *Lamellæ* of the other *Tophus* do: But theſe Shells ſeparate more eaſily than the *Lamellæ*, and ſhew that the Colour often conſiſts in one very thin Shell between two thicker ones.

Such kind of *Tophus*, with *Piſolithi*, is found at other Places; but I have never yet met with any body who could give a ſatisfactory Account of its Formation. Some think the *Piſolithi* are Drops of Water

Water petrified, as they are found commonly near Falls of Water which is impregnated with the like ſtony Matter: And as the ſmalleſt ſcattered Drops of Water fly fartheſt from the Centre, they ſo account for the gradual Diminution in Magnitude of the *Piſolithi*. Others affirm they grow from the Vapour of this petrific Water, though they cannot tell how.

Amidſt this Uncertainty, I determined, whilſt I was on the Spot, to ſpare no Pains to ſearch after (and diſcover, if poſſible) the manner how theſe regular globous Bodies are produced. I have already told you, that the Waters of theſe hot Springs at *Carlsbad* are ſo replete with tophaceous Matter, that where-ever they run, Maſſes of *Tophus* are formed; and when theſe Waters are cold, a Scum (like the little Scales of the ſame Matter) riſes on the Top, ſome of which I ſend you, and I believe you will think it, on Examination, little or nothing different from the Subſtance of the component Matter of the Piſolithi, or from that which forms the common *Tophus*, which I ſuppoſe to differ from the *Piſolithi* only in Appearance.

Firſt of all, I obſerved in the Chinks and Hollows of the ordinary Rock-ſtone very ſmall *Moleculæ* looſely adhering; I found alſo Cluſters of *Piſolithi* in the like Places, and on breaking up a Piece of the Rock by the Side of the River, where it had been burſt by the Water, I diſcovered Maſſes of *Piſolithi* lying in the Chinks, and many looſe ones twirling round and played about in the bubbling Water. My Suppoſition therefore is, that the Stream deſcending from the Body of the oppoſite Mountain, paſſing beneath the River, and afterwards burſting out

out on the Side of the Hill with a conſiderable Force, could not fail to form Caverns in the Side of the Mountain, and to change its Current as the Paſſages became choaked up with the tophaceous Matter: And as I found vaſt Numbers of *Moleculæ* like Grains of Sand in the Chinks where Water paſſed, theſe being waſhed off might ſerve for *Nuclei* to the *Piſolithi*, and being kept in continual Motion by the *Vortex* or Whirling of the Water, would acquire a globular Figure, and by receiving new ſhelly Coats, from time to time, would increaſe in Bulk, ſo long as they were ſuſtained, and whirled about in the Water. And as in this Caſe ſome would be precipitated ſooner, and others later, a Difference in Size muſt conſequently happen, and their Arrangement muſt be according to their Proportion of Surface and Gravity; till the Place becoming full of ſuch Matter, the Water was obliged to ſeek out a new Paſſage. At the Formation of this Kind of *Tophus* in the Caverns, ſome interveniug Accidents from the Motion of the Medium, the Influence of the Air, and other concurring Cauſes, have ſometimes ſo far prevented a compact and firm Conjunction of the component Particles, that in ſeveral Places it ſeems in a decaying State; and is even ſoft as Clay. In the Air indeed it grows again ſomewhat harder, but then it is porous and light: And they call it *Sproudle Sand*. The Inhabitants of a Houſe near the Church have a Hollow, out of which they take this, and ſell it for the ſcouring and poliſhing of Silver, *&c.* In this Hollow it is very warm and ſuffocating, eſpecially in rainy Weather, and then there riſes from it a ſtrong Vapour.

On

On the other Side of the River, at the Foot of the Mountain, are a good many Houſes, and a broad Street; croſs under which the Stream runs, and in the Winter no Snow lies on the Place where it paſſes. Some Rooms in a Houſe built here are always warm like a Bagnio, and in one of the Cellars may be heard the Noiſe of the Water running under Ground. Along this Side of the River are ſeveral hot Springs, which differ in Quality from one another, as well as from the Water of the *Sproudle*. The Principal of theſe is called the Mill-Fountain (from its being near a Mill) which is much uſed, and reckoned milder than the *Sproudle*. It is not near ſo ſaturated with the limy Matter, and forms ſcarce any *Tophus*.

Theſe Springs either have different Origins, or elſe the great Stream divides in the Body of the Mountain into ſeveral Branches; which, according to the Nature of the Paſſages they run through, or from the different Thickneſs of their Columns, and the Velocity they move in, are impregnated with different Matter, and when cold precipitate more or leſs Calx; but their Salts are the ſame, nor is there much Difference in the Quantity they yield. The *Sproudle* is ſo full of the ſtony Matter, that any thing laid into it is covered over with a thick Tophus in a few Days. When the Water is taken up, and let ſtand a little in the Air, it incruſts the Veſſels that contain it, and its Surface is covered with a Scale, like Lime-water, which is made Uſe of as a Dentifrice.

I don't propoſe to inform you of the medical Virtues of theſe Waters, nor to enter into phyſical Accounts of their Origin: I have only in view to ſatisfy you about the Formation of the Specimens I ſend you.

Moſt of the Rocks about *Carlsbad* are an Aggregate of *Spatum, Mica, Quartzum, Rubrica, cum Matrice Lapidis Calcarii,* and cleave into Rhomboids. The Soil on the Side of the Mountain is made by the Diſſolution of ſuch Rocks intermixed with ſome vegetable Earth; and the whole Surface is covered with the leaſt diſſolvable Parts, often adhering together in Maſſes by the Intervention of a limy Matter like incruſted Spatum. And I found higher up the Mountain ſome Rocks moundering into ſuch Soil.

The *Carlsbad* Waters give a good deal of neutral Salt by boiling and cryſtallizing. From 1080 lb. of Water xxii Ounces of pure Salt. I ſend you ſome which I prepared myſelf, ſuſpecting the Apothecary might adulterate it to increaſe the Quantity.

My Thermometer being broke, I procured one of a Friend: But not knowing of what Conſtruction it was, I tried it in the following manner: In melting Ice the Mercury fell to $28\frac{1}{2}$ of its equal Parts, and by the Heat of my Body it roſe to 66 of thoſe Parts. This Thermometer held into the *Sproudle* Fountain roſe by its Head to 96, and in the Mill-Fountain to 67.

About twenty Miles from *Carlsbad* to the South-weſt near the Town of *Eyra,* is a cold Spring of Mineral Waters, much in Uſe in theſe Countries. This gives alſo a Salt much of the ſame Kind. To the South from *Carlsbad* about twenty-five *Engliſh* Miles are likewiſe ſeveral cold Springs: One of which is much richer in this ſame Kind of Salt than the former. It belongs to the Monaſtery of *Toeple.* In the Winter, when they boil this Water, from x lb.

of

of Water they get ſometimes above an Ounce of Salt. They prepare here a neutral Salt, by adding a mineral Acid, or perhaps ſome other neutral Salt (but the Preparation they keep a Secret) which makes it ſhoot into beautiful Cryſtals. It is called *Sal Medium Toeplicenſe*, and is ſold in many Places of *Germany*. I ſend you Specimens of all theſe. On expoſing theſe Salts ſome time to the Air, they fall into a *Magneſia*, but diſſolving and cryſtallizing them again recovers them; tho' the oftener they are diſſolved, the Cryſtals ſhoot the ſmaller.

About ſeven Miles South-weſt from *Carlsbad*, at *Altſettle*, are Mines of black *Schiſtus*, and formerly they made a great deal of Alum and Vitriol from it; but it is now neglected, as they find in the ſame Mines Plenty of *Gleba Pyriticoſa*, from which they diſtil Sulphur. Six hundred Weight of this *Pyrites* give one of Sulphur: And the Oven makes from one to two hundred Weight per Week. The Reſiduum being thrown in great Heaps in the open Air, takes Fire, and conſtantly ſmokes. This Matter they throw into large Reſervoirs of Water, which afterwards they let run off into the Boiling-Houſe, and ſo make Copperas.

About nine *Engliſh* Miles to the South from *Carlſbad*, are the Tin mines of *Schlachtenwald*. They reckon this Mine has been wrought near 500 Years. There are five Entries, four whereof are provided with Machines for hoiſting the Barrels with the Tin Stone: The fifth is for drawing the Water out of the Mine. The Number of Miners who work below Ground are 90: Each Man delivers 25 Barrels of this Stone per Week, and receives

ſomething leſs than Half a Crown Wages. They have different Inventions in the Mine for ſplitting the Rock, but the moſt effectual one is burſting it with Gunpowder. The whole People employed in theſe Mines are about 300. The main Body of the Mine is nearly 700 Feet in Diameter, and from this go ſeveral Eaſt and Weſt; for ſo the Mineral runs. The broadeſt of theſe Ways is about two Feet, and the Mineral in theſe Veins is richer than what is found in the main Body of the Work, whoſe greateſt Depth is 650 Feet. The Tin-ſtone is firſt burnt in Kilns, which they ſay betters the Tin conſiderably, and makes it much more eaſy to ſtamp. After this Preparation it is brought to the Stamp-mills, where by ſtamping it becomes like grey River Sand, which they waſh and ſeparate the Tin from in the following Manner. They throw it by Shovels-full into Baſons where there paſſes a Current of Water, and by keeping of it ſtirring it runs over by a broad Conduit deſcending by Steps, which are covered with coarſe Linen Cloth; and by this Operation the Sand is waſhed away, and the Tin remains on the Cloth in Form of a black ſcaly Powder, and dried is fit for Melting. One hundred Weight of the Stone gives only three Ounces of Tin; and 150 lb. of the clean-waſhed Tin-mineral give 140 lb. of Tin. There are ten Melting Ovens, each whereof can melt nine or ten hundred Weight in twenty-four Hours; the Breadth of theſe Ovens within ſide is eight or nine Inches, and from ten to twelve Feet long, blown by two Pair of Bellows. The Proportion of Charcoal to the Metal is near an equal Weight. They are thrown into the Oven by Degrees, alternately:

The

The Reſiduum they melt three times over, which always yields new Metal. They make here about 800 Centers *per Annum*, which is ſold from fifty-three to fifty-ſix Imperial Gouldens *per Center*. They find ſometimes the black and ſometimes the white cryſtal Mineral in Neſts, or Cluſters: The *Stannum Poledron Nigrum* is a very pure and rich Tin Ore: They ſay the white is rich alſo, but 'tis ſo hard and difficult to melt, that the Tin is burnt to an Aſh before it can be brought to Fuſion.

Near *Geffries*, in *Bareith*, they boil Vitriol. The Mineral from which they make it, is a black *Schiſtus*, ſome of it too is brown. It has ſeveral ſmall Veins of Pyrites in it. When firſt taken out of the Pits it has no Taſte, but after it has been expoſed ſome Time to the Weather, and begins to moulder, it acquires a very ſharpe Taſte. It is laid in great Heaps, under which there are Ciſterns for receiving the Water that runs from it after Rain, or that they pump upon it when the Weather is dry. This Water is conveyed by Conduits into the Boiling-Houſe, where there are two Leaden Kettles, in which it is boiled to a ſtrong Ley, and then let off into Receivers where it ſhoots. Theſe two Kettles make from eight to nine hundred Weight *per* Week, which is all wrought by two Servants: It not having been found neceſſary to add any new Mineral to the Heaps theſe fifteen Years paſt, as they aſſured me. But as the Quantity of the Mineral conſumed in that Time is not known, it is impoſſible to determine how much of this Salt has been ſupplied by the Air. They only add to the Quantity half an hundred Weight of Iron, which is conſumed in the Kettles

every Week, and makes it ſhoot into Copperas; but in Place of this, if they add Copper, it makes blue Vitriol. Formerly they made Alum here likewiſe from the ſame Ley, only inſtead of Iron or Copper they added Pot-Aſh and Urine: But the Expence of the firſt, and the Difficulty of getting the other in ſufficient Quantity, has made them leave off making Alum here for ſome Years paſt.

Of the Salt-mines near CRACAU.

NEAR *Cracau* in *Poland* are famous Salt-Mines, of which I ſhall give you a ſhort Account, as well as of the moſt remarkable Things I found there. The Town is ſituated near the Foot of a vaſt Chain of Mountains, and from it, paſſing by Hills and riſing Grounds about two *German* Miles Southward, I came to the Mines of *Vilitzca*. Theſe are in a Hill flat and irregular above, ſurrounded with Hollows and Vallies, and to the South there is a neighbouring Hill much higher. The Mine has ten Entries, which are provided with Horſe-Engines, whereof ſeven are for hoiſting up the Salt, and the reſt for drawing Water from the Works, and for the Deſcent and Aſcent of the People. I entered the Mine by winding Stairs of 484 Steps, which brought me to the firſt Story. The Deſcent into the ſecond is by ſtrait Stairs of 133 Steps. Into the lowermoſt Story there are no Stairs, but eighteen Ladders from different Floors, which make togerher 300 Feet; and the computed Depth of the Whole is about 900 Feet perpendicular.

The ſeveral Strata of the Earth are as follow.—— On the Surface is a common clayey Ground, next is pure

pure Clay, and then a Bed of ſoft, moiſt, black, ſlimy Earth; and below this are Hills of a Kind of Earth without any Mixture of Grit or Sand. Here are firſt found Particles and Veins of Salt; and, deſcending a good Way through this and ſome Salt Rocks, we enter into the firſt Story, where there are a great many Alleys and Croſs-ways (which are run out to conſiderable Diſtances), and many large Caverns, out of which Salt has been cut. Here the Floor, Walls, and Cielings, are ſolid Salt Rock. As the Religion of the Country is *Roman* Catholic, there are ſeveral large Chapels, with Altars adorned with Columns, Crucifixes, Statues of Saints, and other Ornaments in that Way, hewed out of the Salt Rock, and well wrought in different Orders of Architecture. Some of theſe, which are of the purer Salt, and not much ſmoked with the Torches that the Workmen uſe in the Mine, have a very beautiful Effect. In ſome Places the Sides of the Alleys, and ſome of the great Vaults, are lined and doubled with Timbers, where they thought the Pillars of Earth or Salt left for ſupporting the ſuperior Weight might prove too weak. I obſerved in one Place, that a Sinking of the Earth ſome Years ago had cruſhed ſome of the Baulks almoſt flat, and made a Rent in the Salt Rock on the other Side, about nine Inches wide.

Notwithſtanding there is no Remembrance or Tradition of any remarkable Accident by the Falling-in of theſe Mines, yet they have lately diſcovered a Wooden Houſe, which muſt have been ſwallowed in very long ago. Theſe Mines were on Fire in the Year 1644. but this Accident muſt have happened long before that time; for they have a Plan of theſe Works, taken about 200 Years ago, with Remarks

of

of every thing that was curious in all three Contignations; but no mention is made of this Houſe, nor is there any-thing in the Regiſters of theſe Works that ſhews it to have ſunk in ſince. The Wall of this Houſe is ſeen at the Side of one of the Croſſ-ways: They have found Plates, Spoons, and ſome other Things of Metal; but they make no farther Search, as the Pains would exceed the Profit: So it is left as a Curioſity.

Notwithſtanding the Salt Rocks are on all Sides, and the Earth that is among them is full of Veins and Particles of Salt, there is a Spring of very good freſh Water, which is the Drink of the thirſty Workmen, and of the Horſes employed below-ground. This Source comes from above; but directly over that Place, on the Surface, there is no Well, nor ſpringy Ground, only it is hollow.

They find in theſe Mines Alabaſter, *Glacies Mariæ*, *Gypſum*, and ſometimes *Pectines*, or ſmall Sea ſhells: But the moſt remarkable Thing of all is, in the Middle of a vaſt Salt Rock, a large Tree is found, with all its Branches incaſed in it, lying horizontally. I ſend you a Piece of it, which I hewed out of the Rock myſelf. It ſeems to be a Beech-tree, of which there grow Plenty in theſe Countries at preſent.

From the upper Story the Rocks grow broader like Cones, and the deeper they go, the Salt is always finer, and leſs mixed with Earth: But it is not yet known how deep they run. They do not however find it turns ſo much to Account to work the lowermoſt Story, though it is all pure Rock, the Hoiſting being more expenſive than the running out Croſſ-ways, and working the upper Stories. The

Rocks

Rocks have Roots or Veins, which ſhoot into the Earth on all Sides, ſome in ſtrait Lines, others in Zigzag, even to the Diſtance of Seventy Feet; whereby the Miners are often directed to the Body of the Rock. Theſe Veins are very white and clear, yet they make no Uſe of what is found in them, being impure, and mixt with other Salts: It likewiſe diſſolves much eaſier than the true Salt. *Sal Gemmæ* is found in Veins and Neſts in ſeveral Places of the Mines, but 'tis often very troubleſome to hew, and get it out of the other Salt Rock. Here are no Wells of *Naphtha*, but there are ſome Cavities where the Air is ſo inflamable, that ſome, by going raſhly into ſuch Places with a Light, have been damaged by the Fire, and even run the Riſque of their Lives. This only happens in Places where the Air has no free Admiſſion; for in all the main Streets and croſs Ways there is a conſiderable Draught of Air thro' the Ten Entries: And, in the Winter, while it is a ſtrong Froſt, and quite calm Weither, there reigns a very ſtrong Wind in the Mines: But ſtormy Weather makes no Alteration; and in the Summer there never happen any ſuch Changes.

From the ſeveral Ways are Entries into the Chambers or Vaults where they work. They hew the Sides of the Wall into large ſquare Columns, the Height of the Room, and about Two or Three Feet thick. By driving their Wedges in behind theſe Pillars, they make them rend from the Rock, and their Fall on the Floor makes a very great Noiſe. The Workmen are ſo accuſtomed, that by the Sound of their Blows they know the Inſtant it is going to fall, and get out of the Way accordingly. Sometimes they

they hew the like Pieces from the Floors.—Theſe Pillars are again hewed into Blocks, from Three to Six Feet long, according to their Thickneſs. They are drawn up, and tranſported in ſuch Pieces, and the ſmall in Barrels.

The Quantity of Salt dug here yearly, comes to about 120,000 Centeners of *Vienna:* and the whole Expences for Officers, Workmen, Materials, *&c.* amount to about 100,000 Dollars. The Number of Workmen of all Sorts make about 600 Perſons: They are very healthy and long-lived, not ſubject to the Scurvy, or any particular Diſtempers. The Officers on the contrary are very ſubject to Diſeaſes of the Breaſt, and Conſumptions, which is probably owing to the frequent Changes of Air they meet with, their Buſineſs obliging them to ſtir about much, both above and below Ground, where the Air is very different.

Theſe, Sir, were the moſt material Obſervations I was able to make in the Progreſs of our long March, amidſt my daily Cares and Fatigues in the Duties of my Profeſſion. I ſhall from time to time give you Accounts of whatever I think remarkable, and if you, or any Gentleman of the Royal Society ſhall favour me with any Inquiries concerning the Productions of this Country, I will return the moſt ſatisfactory Anſwer in my Power. I hope to hear of your receiving this, and am,

Sir,

Your moſt humble Servant,

JAMES MOUNSEY.

VIII.

VIII. *The Case of a Lady, who was delivered of a Child, which had the* Small Pox *appeared in a Day or two after its* Birth; *drawn up by* Cromwell Mortimer, *M. D. Secr. R. S.*

THIS Gentlewoman had never had the Small Pox that she knew of, and was accounted by her Relations likewise not to have ever undergone that Distemper. In *Feb.* 1700-1. she was big with Child, and within about a Fortnight or three Weeks of her full Reckoning, when the following Accident happened. A poor Widow Woman, who lived in a lonely Cottage in the Neighbourhood, was seized with the Small Pox, and had nobody to assist or nurse her; the Country People, as much afraid of this Distemper as of the Plague, would neither send her Necessaries, nor suffer her to come to their Shops to buy: Wherefore in this Extremity she made shift to get to this Lady's House, who was noted for her Goodness to the Poor, especially for giving them Medicines when sick: Her Business was to entreat the Lady to desire her Husband to use his Authority with the Overseers of the Poor to appoint a proper Nurse to attend her; for that otherwise she must certainly perish for want of Necessaries; for even the Parish-Officers would not go near her. She expressed a very earnest Desire to speak to the Lady herself, who consented to go to a Window, and spoke to her cross a Court-yard at 30 or 40 Feet Distance, thinking herself safe from Infection in that Situation.

She look'd upon her without any Surpuize, but thought the Sight very diſagreeable, the Woman having her Face and Arms full of a large diſtinct Sort, in the State of Maturation. About a Fortnight after, *viz. Feb.* 25. 1700-1. the Lady was brought to bed of a fine jolly Boy: In a Day or two there appeared an Eruption all over his Skin, which was at firſt taken by the Nurſe for the Red-Gum, tho' the Appearance was earlier than that Diſorder uſually attacks Children; but in a Day or two more it ſhewed itſelf to be the confluent Small Pox. The Child was immediately removed from its Mother; but the Diſtemper proved to be of the very worſt Sort, ſo that the Child died before the Turn: The Mother took no Infection, and lived to the Year 1736. without ever having the Small Pox.

It is very ſurpriſing and wonderful to conſider the different Manners, in which Children, while in their Mothers Wombs, are affected by various Accidents happening to the Mothers. How the Imagination only, affected by the Diſagreeableneſs of the Sight, ſhould convey the Infection to this Child in the Caſe above recited, is, I own, what I am not able to account for; eſpecially as there was no Fright or Surprize, and that the Mother was under no Apprehenſion of Danger.

The above Account is what I lately took down in Writing from a Daughter of the Gentlewoman. Indeed many Years ago I have heard the Lady herſelf mention the Accident; but I did not commit it to Writing; but I think it was with this Difference that ſhe was ſurpriſed, and that the Child was born with the Small Pox upon it, in the eruptive State.

IX.

IX. *Some Accounts of the* Fœtus in utero *being differently affected by the Small Pox.* *By* W. Watſon, *F. R. S.*

Read Dec. 7. 1749. THAT the human Species ſhould only once in their Lives be liable to the Small Pox, has long been obſerved with Surprize, both by Phyſicians and Philoſophers: Nor is it leſs extraordinary, that the Child before Birth, which in every Circumſtance is equally ſupported by its receiving and circulating its Mother's Fluids, ſhould be ſo differently affected by that Diſtemper.

From the Diſſections of thoſe who have died of the Small Pox, we find that the *Viſcera* are ſubject to the variolous Abſceſſes as well as the Skin; but that the *Fœtus* does not always partake of the Infection from its Mother, or the Mother from the *Fœtus*, is the Subject of this Paper.

About four Years ſince I attended a young Man, a Servant to a Carpenter, who had a very putrid and offenſive kind of Small Pox; of which nevertheleſs he recovered. His Miſtreſs, during his Illneſs, came frequently into his Room, and ſometimes continued there a conſiderable Time. She was then about ſeven Months gone with Child, but had had the Small Pox herſelf many Years before. At the uſual Time ſhe was delivered of a Girl, whom I ſaw very ſoon after its Birth: and there appeared very plainly the Marks of about forty Puſtules, in different Parts of her Body. From this Appearance I then inform'd the Parents, that I apprehended the Child

would hereafter be very ſecure from the Infection: But as about a Month ago the Parents thought proper to have a little Boy of theirs inoculated, I requeſted that they would permit the before-mentioned Girl to be inoculated likewiſe. As I deſired, they were both inoculated, from a Child of my own, who had, from Inoculation, had a favourable Kind. Upon the tenth Day after the Operation the Boy ſickened, and had the Small Pox, very favourably: About the ſame Time the Girl grew pale, and loſt her Appetite. This Indiſpoſition continued for two or three Days, and then ſhe recovered.

In both theſe Children, the Inciſions, which were made only in one of their Arms, were extremely ſuperficial, and inflamed in both as uſual: That in the Boy produced the variolous Fever and its Attendants, as is before-mentioned; but in the Girl occaſioned only a Paleneſs and Loſs of Appetite without a Fever, and one variolous Abſceſs in one Part of the Inciſion, ſuch as is ſometimes ſeen in Nurſes, and in thoſe who have attended Perſons in the Small Pox, who have had it themſelves before. This one Puſtule was a ſufficient Argument of the variolous Matter taking Place, and endeavouring to excite the uſual Symptoms.

Dr. *Mead* in his learned Treatiſe concerning the Small Pox takes Notice of a Woman's attending her Husband, who, a ſhort Time before ſhe expected her Delivery, was ill of the Small Pox. As ſhe had undergone the Diſtemper herſelf a conſiderable Time before, ſhe felt no Inconvenience therefrom; but upon her Delivery the Child was found dead, and its Body covered with the Small Pox.

Theſe

Theſe two Hiſtories evince, that the Child before Birth, though cloſely defended from the external Air, and enveloped by Fluids and Membranes of its own, is not ſecure from the variolous Infection, though its Mother has had the Diſtemper before. They demonſtrate the very great Subtility of the variolous Effluvia; as we find them capable either from their floating in the Air, and by their being taken in by the Inſpiration of the Mother, or by penetrating the abſorbent Veſſels upon her Skin, and thus mixing with her Blood, of exerting their Effects upon the Child: And we may obſerve further from the firſt of theſe Caſes, that it is poſſible for the Child to live through the Small Pox before its Birth; as well as that after that Period under the before-mentioned Circumſtances it is not liable to the Infection again.

The following Hiſtory is equally remarkable with the preceding.

A Lady of high Birth and Quality now living, well known to ſeveral Members of this learned Body, had the Small Pox to a great Degree when ſeven Months gone with Child; notwithſtanding which ſhe went her Time and was delivered of a Son, who did not appear to have upon his Body any Marks of the Diſtemper. As this Lady had been ſeverely handled by the Small Pox, it was judged that her Child would never after be liable thereto; nevertheleſs when about four or five Years old, he was attacked with the Diſtemper, but got very well through it, and is now alive.

A Caſe in ſome reſpects reſembling this laſt is taken Notice of by *Mauriceau* *, who delivered a Woman of

* See *Mauriceau ſur les maladies des femmes groſſes*, Caſe 576.

of an healthy Child at her full Time, who during the fifth Month of her Geſtation had had the Small Pox to a great Degree; although the Child, from any Marks of its Body, did not appear to have been affected with the Diſtemper.

Theſe Caſes are the very Reverſe of the former; where though from Inoculation the moſt minute Portion of Lint, moiſtened with the variolous Matter and applied to the ſlightly wounded Skin, is generally ſufficient to propagate this Diſtemper; yet here we ſee that the whole Maſs of the Mother's Blood, circulating during the Diſtemper through the Child, was not ſufficient to produce it.

It generally happens, as we are informed by medical Writers, and as I myſelf have ſeen in Practice, that if Women are delivered during the Courſe of the Small Pox, the Diſtemper of the Child does not keep Pace with that of its Mother, but is ſubſequent thereto. Thus the Child of the Lady, mention'd by the learned Dr. *Mead**, who was brought to bed on the eleventh Day, when labouring under a very malignant Small Pox, was born without any Appearance of the Puſtules; but on the fourth Day after its Birth the Child was ſeized with Convulſions, and died at the Eruption of the Small Pox. And in a Woman, whom I attended, and who was delivered of an apparently healthy Child upon the ninth Day of a diſtinct Small Pox, the Child was not ſeized until the eighth Day after its Birth, which is about the Time that the Infection would have taken Place, if it had been received from any other Quarter, independent of its Mother's having the Diſtemper before its Birth.

From

* Vide *Tract. de Variolis*, pag. 66.

From theſe Hiſtories it appears, that the Child before its Birth ought to be conſider'd as a ſeparate, as a diſtinct Organiſation; and that, though wholly nouriſh'd by its Mother's Fluids, with regard to the Small Pox, it is liable to be affected in a very different Manner, and at a very different Time, from its Mother.

X. *The Caſe of* Nicolas Reeks, *who was born with his* Feet turned inwards, *which came to rights after being ſome time uſed to ſit croſs-legged. Tranſmitted from* Wm. Milner, *Eſq; at* Poole, *to Sir* Peter Thompſon, *Knt. F. R. S.*

Read Dec. 7. 1749. *Nicolas Reeks* was born in the Town of *Poole*, 1724. with both his Feet turn'd inwards. His Mother carried him to a Surgeon, who upon Examination gave it as his Opinion that he was incurable. The Boy, as he grew up, was with great Difficulty able to walk, but always on the outward Edge of his Feet and Heels, ſo that he frequently fell down in walking, one Foot ſtriking againſt the other.

His Parents being poor, in 1735. the Pariſh put him Apprentice to Mr. *Richard Mocket*, of the ſame Town, Taylor, apprehending it the only Trade he could be fit for as a Cripple. His Shoes were made in a peculiar manner to lace on to his Legs, the Muſcles

Muſcles of which were much ſmaller than thoſe of Boys of his Age. He lived with his Maſter, and worked at the Trade, till about 1741. when they began to perceive a manifeſt Alteration and Turn in both of his Feet; which was brought on without the Aſſiſtance of any manner of Art, Application of Plaiſters, Oils, or Bandages, till both Feet were turned to their right and natural Situation. He was able to wear his Maſter's Shoes, the Muſcles of his Legs grew larger, his Feet and Legs like other Peoples of his Age; if any Difference, they turned outwards more than others do. In *March* 174$\frac{2}{3}$. he ran away from his Maſter, entered on board a Ship of War as a Marine, and is now living at *Portſmouth*.

Nov. 1. 1749.

'I *Richard Mockett*, having read over the foregoing Caſe, do hereby certify, that *Nicolas Reeks* was a Cripple, as therein deſcribed, when I took him an Apprentice; and that he was cured, whilſt he lived with me, without any Advice, Aſſiſtance, or Application of Medicine, or Bandage whatever: And I am of Opinion the Cure was performed by his ſitting croſs-legg'd on the Shop-board; as witneſs my Hand, in *Poole*, 1ſt *Nov.* 1749.

'*Richd. Mockett.*'

'We whoſe Names are hereunto ſubſcribed, do well remember, that *Nicolas Reeks*, mentioned in the foregoing Certificate, and formerly apprenticed to Mr. *Richard Mockett*, was born hurl-footed in both Feet, and a Cripple; and do know, that he

'was

'was cured, and well able to walk, before he left 'his ſaid Maſter; and do believe it was performed 'without any Art or Aſſiſtance whatever, than as 'expreſs'd above; as witneſs our Hands,

'*Mabella Glover.*
'*Eliz. Glover.*
'*Suſannah Jaſper*, the
'Boy's own Aunt.'

The foregoing Account of the Cripple *Nicolas Reeks* was drawn up in ſuch Terms as were moſt agreeable to the Apprehenſions of the Perſons who have certified the Truth of the Fact, and to whom it was firſt read: And I am well ſatisfied in the Credibility of their Teſtimony, and that many other Perſons of Reputation might be called on, who would ſign the ſame.

Cuſtomhouſe, Poole, Nov. 11. 1749. W. MILNER.

XI. *A Letter from Mr.* James Short, *F.R.S. to the Preſident, with the* Deſcription *and* Uſes *of an* Equatorial Teleſcope.

SIR,

Read, Dec. 7. 1749. I Send you along with this the Deſcription and Uſes of the Equatorial Teleſcope, as alſo a Drawing of it; which you deſired of me ſome time ſince, in order that it might be laid before the Society. I have made three of theſe Inſtruments, one of which was bought by Count *Bentink*

for the Prince of *Orange*; the other two I have ſtill by me, one of which I ſhall ſhew to the Society. I do not pretend to any-thing new in the Combination of theſe Circles, of which this Inſtrument conſiſts, the ſame Combination having ſeveral times been made before me, by way of a Dial: But I believe the putting ſo large a Teleſcope upon this Machinery, and applying it to the Uſes which I have done, is ſome what new. I am,

SIR,

Surry-ſtreet, 7th Dec. 1749. *Your moſt obedient humble Servant,*

JA. SHORT.

Deſcription and Uſes of the Equatorial Teleſcope, or Portable Obſervatory.

THIS Inſtrument conſiſts of two circular Planes or Plates, mark'd *AA* in the annexed Drawing, *Tab.* III. which are ſupported upon four Pillars; and theſe are again ſupported upon a Croſs-foot, or Pedeſtal moveable at each End by the four Screws *BBBB:* The two circular Plates *AA* are moveable, the one above the other, and are called the horizontal Plates, as repreſenting the Horizon of the Place; and upon the upper one are placed two Spirit-Levels, to render them at all times horizontal: Theſe Levels are fixed at Right-Angles to one another: This upper Plate is moved by a Handle *C*, which is called the Horizontal Handle, and is divided into 360°, and has a *Nonius* Index divided into every three Minutes,

Above this horizontal Plate there is a Semicircle *DD*, divided into twice 90°; which is called the Meridian Semicircle, as repreſenting the Meridian of the Place,

Place, and is moved by a Handle *E*, which is called the Meridian Handle, and has a *Nonius* Index divided into every three Minutes.

Above this Meridian Semicircle is faſten'd a circular Plate, upon which are affixed two other circular Plates *FF*, moveable the one upon the other, and are called the Equatorial Plates; one of them, repreſenting the Plane of the Equator, is divided into twice 12 Hours, and theſe are ſubdivided into every 10 Minutes of Time. This Plate is moved by a Handle *G*, called the Equatorial Handle, and has a *Nonius* Index for ſhewing every Minute.

Above this Equatorial Plate there is a Semicircle *HH*, which is called the Declination-Semicircle, as repreſenting the Half of a Circle of Declination, or horary Circle, and is divided into twice 90°, being moved by the Handle *K*, which is called the Declination-Handle. It has alſo a *Nonius* Index for ſubdividing into every three Minutes.

Above this Declination-Semicircle is faſtened a Reflecting Teleſcope *LL*, of the *Gregorian* Conſtruction, the focal Length of its great Speculum being 18 Inches.

In order to adjuſt the Inſtrument for Obſervation, the firſt thing to be done, is to make the Horizontal Plates level or horizontal, by means of the two Spirit-Levels, and the four Screws in the Croſs-Pedeſtal. This being done, you move the Meridian Semicircle, by means of the Meridian Handle, ſo as to raiſe the Equatorial Plates to the Elevation of the Equator of the Place; which is equal to the Complement of the Latitude (and which, if not known, may likewiſe be found by this Inſtrument, as ſhall be afterwards

ſhewn). And thus the Inſtrument is ready for Obſervation.

To find the Hour of the Day, and Meridian of the Place.

Firſt find, from aſtronomical Tables, the Sun's Declination for the Day, and for that parricular Time of the Day; then ſet the Declination-Semicircle to the Declination of the Sun, taking particular Notice whether it is North or South, and ſet the Declination-Semicircle accordingly.

You then turn about the Horizontal Handle, and the Equatorial Handle, both at the ſame time, till you find the Sun preciſely concentrical with the Field of the Teleſcope. If you have a Clock or Watch at hand, mark that Inſtant of Time; and by looking upon the Equatorial Plate, and *Nonius* Index, you will find the Hour and Minute of the Day, which comparing with the Time ſhewn by the Clock or Watch, ſhews how much either of them differ from the Sun. In this manner you find the Hour of the Day.

Now, in order to find the Meridian of the Place, and conſequently to have a Mark, by which you may always know your Meridian again, you firſt move the Equatorial Plate, by means of the Equatorial Handle, till the Meridian of the Plate, or Hour-line of 12. is in the Middle of the *Nonius* Index; and then, by turning about the Declination-Handle till the Teleſcope comes down to the Horizon, you obſerve the Place or Point which is then in the Middle of the Field of the Teleſcope; and a ſuppoſed Line drawn from the Center of this Field to that Point in the

the Horizon, is your Meridian Line. The beſt time of the Day for making this Obſervation for finding your Meridian, is about three Hours before Noon, or as much after Noon. The Meridian of the Place may be found by this Method ſo exact, that it will not differ at any time from the true Meridian above 10″ of Time; and if a proper Allowance be made for the Refraction at the time of Obſervation, it may be found much more exact. This Line thus found will be of Uſe to ſave Trouble afterwards; and is, indeed, the Foundation of all aſtronomical Obſervations.

To find a Star or Planet in the Day-time, even at Noon-day.

The Inſtrument remaining as rectified in the laſt Experiment, you ſet the Declination-Semicircle to the Declination of the Star or Planet you want to ſee; and then you ſet the Equatorial Plate to the Right Aſcenſion of the Star or Planet at that time, and, looking thro' the Teleſcope, you will ſee the Star or Planet; and after you have once got it into the Field, you cannot loſe it: For, as the diurnal Motion of a Star is parallel to the Equator, by your moving the Equatorial Handle ſo as to follow it, you will at any time, while it is above the Horizon, recover it, if it be gone out of the Field.

The eaſieſt Method for ſeeing a Star or Planet in the Day-time is this: Your Inſtrument being adjuſted as before-directed, you bring the Teleſcope down ſo as to look directly at your Meridian Mark; and then you ſet it to the Declination, and Right Aſcenſion, as before-mentioned.

By this Inſtrument moſt of the Stars of the firſt and ſecond Magnitude have been ſeen even at Mid-day,

day, and the Sun ſhining bright; as alſo *Mercury*, *Venus*, and *Jupiter*: *Saturn* and *Mars* are not ſo eaſy to be ſeen, upon account of the Faintneſs of their Light, except when the Sun is but a few Hours above the Horizon.

And in the ſame manner in the Night-time, when you can ſee a Star, Planet, or any new Phænomenon, ſuch as a Comet, you may find its Declination and Right Aſcenſion immediately, by turning about the Equatorial Handle, and Declination-Handle, till you ſee the Star, Planet, or Phænomenon; and then, looking upon the Equatorial Plate, you find its Right Aſcenſion in time; and you find, upon the Declination-Semicircle, its Declination in Degrees and Minutes.

In order to have the other Uſes of this Inſtrument, you muſt make the Equatorial Plates become parallel to the Horizontal Plates; and then this Inſtrument becomes an *Equal Altitude Inſtrument*, a *Tranſit Inſtrument*, a *Theodolite*, a *Quadrant*, an *Azimuth Inſtrument*, and a *Level*. The manner of applying it to theſe different Purpoſes is too obvious to need any Explanation.

As there is alſo a Box with a magnetic Needle faſtened in the lower Plate of this Inſtrument, by it you may adjuſt the Inſtrumenr nearly in the Meridian; and by it likewiſe you may find the Variation of the Needle: If you ſet the Horizontal Meridian, and the Equatorial Meridian, in the Middle of their *Nonius* Indexes, and direct your Teleſcope to your Meridian Mark, you obſerve how many Degrees from the Meridian of the Box the Needle points at; and this Diſtance or Difference is the Variation of the Needle.

XII.

XII. *An Eclipſe of the Moon, obſerved at Mr.* Graham's *in* Fleet-ſtreet, *by* John Bevis, *M.D. and Mr.* James Short, *F.R.S.*

[*Read* Dec. 14. 1749.]

1749.	By the Clock.	App. Time.	
	h ′ ″	h ′ ″	
Dec. 11.	23 56 15½		The Sun paſs'd the Meridian.
12.	6 43 0	6 46 36	A ſenſible *Penumbra*.
	6 47 20	6 50 56	Eclipſe begins.
	7 1 26	7 5 1	Shadow touches *Tycho*.
	7 3 12	7 6 47	*Tycho* half covered.
	7 4 38	7 8 13	*Tycho* covered.
	8 33 37	8 37 11	*Tycho* begins to be uncovered.
	8 34 50	8 38 24	*Tycho* half uncovered.
	8 36 9	8 39 43	*Tycho* quite uncovered.
	9 9 5	9 12 38	Eclipſe ends.
	9 13 30	9 17 3	*Penumbra* gone.
	12 5 53½		Moon's Center paſs'd the Meridian.
	12 20 2		*Sirius* paſs'd, his Mean Right Aſcenſion being 98° 31′ 38″.
13.	23 56 46		The Sun paſs'd the Meridian.

The Appulſes of the Shadow to the Spot *Tycho* were obſerved with a Reflecting Teleſcope, which magnified about 40 times, and may be ſerviceable for geographical Purpoſes. The Beginning and End of the Eclipſe were eſtimated by the bare Eye, and a Refracting Teleſcope of a ſmall magnifying Power; larger Powers being apt to dilute the Shadow too much, and thereby render theſe Phaſes more uncertain.

	Apparent Time.
A Computation by Dr. *Halley*'s Tables gave the Beginning - - - -	6h 52′ 0″
End -	9 14 58

XIII.

XIII. *An Account of an extraordinary* Meteor *ſeen in the County of* Rutland, *which reſembled a* Water-Spout, *communicated to the* Preſident, *by* Tho. Barker, *Eſq*;

Read Dec. 14. 1749. SEPT. 15. 1749. a remarkable Meteor was ſeen in *Rutland*, which I ſuſpect to have been of the ſame kind as Spouts at Sea; being much like the Account of two ſeen at *Hatfield* in *Yorkſhire*; *Phil. Tranſ.* No. 281. p. 1248. and No. 284. p. 1331.

It was a calm, warm, and cloudy Day, with ſome Gleams and Showers; the Barometer low and falling, and the Wind South, and ſmall. The Spout came between 5 and 6 in the Evening; at 8 came a Thunder-Shower, and Storm of Wind, which did Miſchief in ſome Places; and then it cleared up with a brisk N. W. Wind.

The earlieſt Account I have was from *Seaton*. A great Smoke roſe over or near *Gretton*, in *Northamptonſhire*, with the Likeneſs of Fire, either one ſingle Flaſh, as the Miller ſaid, or ſeveral bright Arrows darting down to the Ground, and repeated for ſome Time, as others ſay. Yet ſome who ſaw it, did not think there was really any Fire in it, but that the bright Breaks in a black Cloud looked like it. However, the Whirling, Breaks, Roar, and Smoke, frightened both Man and Beaſt. Coming down the Hill, it took up Water from the River *Welland*, and paſſing over *Seaton* Field, carried away ſeveral Shocks of Stubble; and croſſing *Glaiſ-*

ton,

ton, and *Morcot* Lordſhips, at *Pilton* Town's End, tore off two Branches, and carried one of them a good way. In a Hedge-row in the Meadow, at Right Angles to the Spout's Courſe, ſtood an Oak and an Aſh 15 Yards aſunder; the Oak a young ſound one, 16 Inches thick, it ſplit two Yards down, and one Half fell to the Ground, but was not quite parted from the other; the Aſh, about 8 Inches thick, was torn off in the Middle, and carried 10 or 12 Yards. Between and on each Side of theſe Trees were other ſmaller ones, which were not hurt: I heard of no Harm it did after, but breaking and ſcattering a few Boughs. I ſaw it paſs from *Pilton* over *Lyndon* Lordſhip, like a black ſmoky Cloud, with bright Breaks; an odd whirling Motion, and a roaring Noiſe, like a diſtant Wind, or a great Flock of Sheep galloping along on hard Ground; it was divided into two Parts all the Way it went, and tho' there was no Wind, moved apace from S. by W. to N. by E. As it went by a Quarter of a Mile Eaſt from me, I ſaw ſome Straws fall from it, and a Part, like an inverted Cone of Rain, reached down to the Ground. Some who were milking, ſaid it came all round them like a thick Miſt, whirling and parting, and, when that was paſt, a ſtrong Wind for a a very little while, though it was calm both before and after. It then paſſed off between *Edithweſton* and *Hambleton*, but how much further I do not know.

XIV. *An Enquiry into the original State and Properties of* Spar, *and* Sparry Productions, *particularly, the* Spars, *or* Cryſtals *found in the* Corniſh *Mines, called* Corniſh Diamonds. *In a Letter to* Emanuel Mendez da Coſta, *Eſq; F. R. S. from the Rev. Mr.* Wm. Borlace.

SIR,

Read Dec. 14, 1749. May 3, 1750. SINCE among your Searches into Natural Hiſtory, you think it worth your while to be particularly inquiſitive after our cryſtallized Spars, commonly called *Corniſh Diamonds*; I will give you the beſt Information I can concerning them, aſſuring myſelf, that you will make proper Allowances for the want of ſuch Aſſiſtances as are not to be had in my preſent Situation.

I ſhall conſider Spar here as the Genus, at the Head not only of all the Species of common Spar, and Incruſtations of what Colour ſoever, but of Cryſtals and Gems, which are here underſtood only as finer and purer Subſtances of the Spar Kind (1).

There

(1) The Properties of Cryſtal aſſigned by a late Treatiſe (*Mr.* Hill's *Nat. Hiſt. of Foſſils*), ſuch as keeping itſelf unaffected by Acid Menſtrua, remaining unaltered in a moderate Fire, and giving forth Sparks of Fire by Colliſion (whereby that Author diſtinguiſhes it from Spar), are here reckoned, rather to be accidental and claſſical Differences, owing to a purer ſtony Juice, leſs friable and

There are ſeveral Sorts of theſe ſparry Productions, which are carefully to be diſtinguiſh'd from each other; but they may all be conſidered, firſt, with regard to their original State, or what they have been; and, in the next Place, as to what they now are, that is, as to Form, Size, Colour, Hardneſs, Texture of Parts, and Direction of their Shoots in the Mines or Quarries. Theſe Particulars, ſeparately diſcuſſed, may poſſibly lead us to ſeveral probable Conjectures concerning the Original and moſt diſtinguiſhing Properties of theſe Bodies, ſuch as may afford ſome Light to this perplexed and intricate Subject.

Sect. I.

That all Spar has been, at one time or other, in a State of Fluidity, may be maintained, I think, with great Reaſon, as well as ſupported by the Authority of ſome of the moſt eminent Naturaliſts (2). In ſome Spars are found Straws, and other light Bodies; and we may therefore as juſtly conclude them to have been once fluid, as the Amber that incloſes the Bee. In ſome Stones, whereon were ſparry Concretions,

and terrene than that of the common Spar, than to any eſſential and radical Difference in the Principia of theſe Bodies. [" There is in "all Spar more or leſs of Cryſtal." *Woodward's Nat. Hiſt. Foſſils*, 158.] For many Spars there are, which are opaque, and yet in the ſame hexagonal Form as Cryſtals; whence it appears, that Spar and Cryſtal do not differ in Subſtance and Nature, but in Tranſparency, Colour, and different Degrees of Purity. " Spars much the ſame with Cryſ- " tals, ſays Dr. *Plot*, *Oxf. p.* 98. §. 52." And *Boetius* doubts not, but they (*viz.* Spars) are of the ſame Matter with Gems, *ib.* §. 53.

(2) *Woodward's* Catal. of Foſſ. Vol. 1. p. 151, and 157. No. 78. *alibique paſſim.*

Dr. *Woodward* found Fragments of Shells, and Pellicles of the Ova of Fiſhes; a certain Evidence, that this ſparry Production was not anterior to the Deluge; for the Stone muſt have coaleſced and hardened upon the Shell, before the ſparry Concretion could have fixed upon the Surface of the Stone; and as I apprehend, the Learned are now very well ſatisfy'd, that ſuch extraneous Foſſils as are mentioned above, are not the *Luſus Naturæ*; but the Exuviæ of Animals brought where we find them by the Waters of the Deluge.—Where-ever any Number of the ſhotten Spars occur, there may be ſeen ſucceſſive Incruſtations and Cryſtals fixing on other Cryſtals, ſome Incruſtations broken off, and ſhewing their concave Baſe, ſhaped by the Cuſpis or Apex of the Diamonds on which they were once faſtened; which ſhews, that there has been a Succeſſion of ſeparate and diſtinct Indurations. —— In ſeveral Places we find wavy Proceſſes * formed in thin Plates, on the perpendicular Sides of the Rocks, by the Spars flowing down in the ſame Manner, as one Wave ſucceeds another on the Sea-Shore; to which we may add, the frequent Formation of ſparry Efflorefcencies, Accretions on Walls, and Stalactites hanging down from the Vaults and Caverns of deſerted Mines, Evidences ſufficient of the modern Date of ſuch Productions. That we may the eaſier apprehend this Truth of Spars having been once a Fluid (upon which much depends), it may here be obſerved, that ſomething very like this Proceſs, (I mean Liquors hardening into Stone) is commonly ſeen in the Effects of petrifying Waters; where as ſoon as the ſtony Juice

* See *Tab.* V. *Fig.* 22.

meets

meets a proper Nidus of Wood, Reed, Graſs, or the like, it will forſake its State of Fluidity, and become a ſolid Stone: Why then ſhould it ſeem more unaccountable or difficult, to conceive that the ſame Alteration ſhould happen in the Bowels of the Earth, and in larger Maſſes of Matter? For as the ſame Cauſe will in like and equal Circumſtances produce the ſame Effect, ſo to produce a greater Effect (*viz.* an Alteration of Form or Motion in a greater Quantity of Materials), there is need only of a proportionably greater Force in the Cauſe; it being as eaſy for a powerful Effort to produce a Rock, or a Mountain, as for a ſmaller Force to congeal a Pebble, or form the ſmalleſt Gem. If it were poſſible, therefore, for us to be as attentive Witneſſes of the Changes which happen under the Surface, as we are of thoſe which appear on the Banks of every petrifying Spring, we ſhould diſcover many new Stones produced every now-and-then, which by their Firmneſs appear now to have been as old as the World (3). It is indeed a vulgar Miſtake to imagine, that Time has added, or ſhall add, to the Firmneſs of a Spar; or becauſe it is ſo hard and compact a Body, that it cannot therefore but be as old as the firſt Formation of Things; for Spar becomes as hard at the firſt Time of its conſolidating, as it will be ever after, as we find by the exact

(3) Since the Writing of the following Treatiſe, Mr. *Hill* (*Nat. Hiſt. of Foſſils*, *p.* 157.), by a curious chemical Inveſtigation of the lapideous Contents of Water, ſays, "That Stones and Minerals, "formed of Cryſtal and Spar, need not be ſuppoſed all of them as "old as the Creation or Deluge; but may be, and unqueſtionably "are, formed to this Day."

Shape,

Shape, and the ſmooth Sides which *Corniſh Diamonds* make in Incruſtations, and all after and ſecondary Concretions. This ſparry Liquor is ſtiff and ſluggiſh, and apt to harden; but it is a Liquor however, before it becomes a Stone. —— Nor is this Opinion ſingular, but adopted by many of the Moderns as well as Antients. *Pliny* (4), from the Reſemblance that Cryſtals have to Water, carried this Hypotheſis much too far, and thought them to be nothing more than Water congealed by exceſſive Cold; and *Diodorus* eſteems them no better than a Concretion of pure Water, aſſigning however a different Cauſe, concluding them harden'd by a divine Heat. *Agricola* makes the *Succus lapideſcens* the original Matter of which Stones are formed, ſome by the Heat, others by the Cold (5) they meet with, during the State of Fluidity (6). Mr. *Geoffroy's* Hypotheſis ſuppoſes Cryſtal to be formed of thin equable Plates, that Water is the Vehicle of cryſtalline Parts; and when thoſe Parts meet together in any Quantities, the Water eaſily evaporating leaves the Cryſtals to form themſelves into hard, pellucid Bodies. Mr. *Boyle's* Opinion was, that theſe Bodies were originally in a fluid State (7).

(4) *Lib.* 37. *c.* 2.

(5) "*Utroque enim modo effici poteſt Lapis.*" *Ag. de Ort. Subt. Lib.* 4. *Baſil. Edit. p.* 57.

(6) *Ib. p.* 56.

(7) See *Boerhaave's* Theory of Chemiſtry, by *Shaw*, *Not.* 120.

SECT.

Sect. 2.

Whence this Fluidity.

'Tis Water that firſt occaſions, and afterwards maintains, this Fluidity; and the Reaſon why we find none of this ſparry Maſs in its fluid State, nor ever ſee this lapideous Juice, is, becauſe that whilſt it remains incorporated with the Water, it is not to be diſtinguiſh'd from the Liquor in which it ſwims; and as ſoon as ever it is deſerted by the Water that circulated it in the Bowels of the Earth, and other neceſſary Circumſtances concur to produce that Change, it becomes Stone: By Water it is that the ſparry Atoms are waſhed forth out of their Repoſitories (8), collected into a thick, tranſparent, or opaque Juice (the ſtony Particles attracting each other as much as the intermediate Water will give leave); and as ſoon as the redundant Water is drained off, or evaporated, the lapideous Parts (now more at Liberty) accede to a cloſer Union, and are aſſiſted greatly therein, as well by the condenſing Nature of Cold, which compreſſes the Parts, and forces them nearer one to the other, as by ſudden evaporating Heats; and thus the Stone forms itſelf, ſo much Water reſting in the Pores and Interſtices of the Parts (in proportion to the Number and Magnitude of thoſe Pores), as is neceſ-

(8) *Woodward*'s Nat. Hiſt. of the Earth, 2d Edit. p. 189. "Water is the only Agent that educes the Matter, of which they "(*viz.* Spar and Cryſtal) conſiſt, out of the Strata, and compiles "and forms it in the perpendicular Fiſſures." *Woodward*'s *N. Hiſt. of Foſſ.* Vol. 1. p. 150.

ſary

ſary to fix it into a Conſiſtency; for, as I apprehend, there is no compound Body, but by means of the Chemiſt's Fire will yield ſome Water; but as ſoon as all the Water is thrown off, the Body loſes its Hardneſs and Continuity, and turns to a Calx and Powder.

Here, Sir, I beg Leave to propoſe a few Queries to you.

1*ſt Query*, Whether Spar is not the univerſal Gluten of Stones, diſtinguiſhed from each other by the various Mixtures of earthy, mineral, or metallic Particles, but all united by the ſparry Liquor? Of this I ſhould be glad to have your Opinion; for it ſeems to me, that there is ſcarce any Sand, Nodule, Stone, or Ore, which either by the naked Eye, or Glaſſes, may not be diſcerned to have a certain Portion of Spar, clear, or opaque, in its Compoſition.

2*d Query*. Whether it is not reaſonable to believe, that Stones in all Ages have been, and are ſtill forming in the Earth, in ſome ſuch Manner as is here mentioned, whenever the neceſſary Materials and Cauſe concur with proper Incidents?

3*d Query*. Whether this Hypotheſis is not better adapted to account for teſtaceous, and other extraneous Bodies, found incloſed ſo often in Maſſes of Stone, than Dr. *Woodward*'s Suppoſition, that all Stones were reduced into a fluid Maſs by the Waters of the Deluge; which Waters being thoſe of the Ocean, we cannot allow to have any ſuch diſſolving Power

Power inherent in them, and therefore they could produce no ſuch Effect?

4th Query. Whether there are not Quarries of Stone, which when left idle, or unwrought for ſome Time, yield a freſh Supply of Stone in the Chanels and Hollows of the ſaid Quarries, which had been before thoroughly cleared by the Workmen (9); and whether this will not confirm the Suppoſition, that Stones formed ſince the Deluge, in Places where Shells, Teeth, and the like Bodies, were depoſited by the Waters, incloſed them in their Subſtance?

You will excuſe this Digreſſion.

Sect. 3.

Different Appearances of Spar.

Our *Corniſh* Spars are either plain, ſimple, and unfigured, or figured into various and rectilineal Shapes.

All ſparry Liquor is in itſelf ſtiff and ſluggiſh, and covets no Shape; but, being intimately mixed with Water, which is the reſtleſs Agent, to diſperſe, collect, and renew all ſubterraneous Nature, it moves as a Fluidby the Rules of Gravitation, that is, from an higher to a lower Poſition, till meeting with a retentive Bed, the Water no ſooner retires, and leaves it expoſed to a drier or colder Air, than it dries, and hardens into Stone, in Shape and Size, as the Attraction and Quantity of its own Parts determine, or

(9) See *Addiſon's* Travels into *Italy*, and Bp. *Burnet*.

the circumambient Bodies will give it Leave to fix and extend itſelf.

Plain Spars.

Sometimes we find the ſparry Liquor ſpread into thin Plates on the horizontal or oblique Planes of Rocks; ſometimes we trace it in Sheets down the Sides of Fiſſures; and where it meets with Impediments of Gravel, or Stone, it will reſemble branched Limbs, Clay, Boughs, and Stumps of Shrubs; ſometimes it drops from Vaults, and Roofs of Caves, whence it has the Name of *Stalactites* (10). In all theſe Caſes it is plain, that the Juice had no other Motion, whilſt a Juice, nor appears in any other Shape now a Stone, than what its own Weight or Gravitation, during its State of Fluidity, inclin'd it to. In theſe uninform'd rude Productions, it is very plain, I think, that the Juice wanted thoſe active Principles (whatever they be), which enable it at other Times to ſhoot into regular Forms.

Fig. 1. TAB. IV. (11). is a Spar Pebble, its Surface about the Roughneſs of the Peach-skin, incloſed in Part of its Socket, which is alſo of Spar, angular, and puculated (which latter Property is rarely met with): The Coat or Socket is mixed with ſolid white Mundic, and Cockle; which laſt (or the ſame Principle, which throws Cockle (12) into this oval Figure) ſeems to have determin'd this Spar to its ſingular, *viz.* orbicular Shape; for it is obſerved, that

(10) It alſo veins or granulates, or both, every Kind of Stone; and is oftentimes found to compoſe whole Loads or Veins, without any metallic or mineral Mixture, or any particular Shape, more than the Fiſſure in which it reſted compreſſed it into.

(11) *N. B.* The following Figures, referred to, are intermixed in TABB. IV. and V.

that where Cockle is plenty, Spar-Nodules round as Musket Balls, and black, in Sockets of the ſame Colour and Subſtance, are frequently found.——But as this Pebble was not black, as Cockle always is; it may therefore be queſtioned, whether the Shape of it may not be owing to ſome metallic (*viz.* Iron or Copper) Principle, rather than to Cockle, and whether Cockle itſelf be not more probably indebted to other Powers for its orbicular Nodules, in ſuch Sheaths, than derive them from any inherent Activity of its own.—The Exterior of the Shell or Socket has a thin Incruſtation of gritty cinercous Mundic.——It came out of *Wheal Royal* Mine, in the Pariſh of *Cambron, Cornwall.*

Of Incruſtations.

The next Appearance of Spar Bodies, which I ſhall here take Notice of, is that of Incruſtations; theſe ſometimes make one continued Sheath, Lump, or Maſs, and incloſed in them we find *Coruiſh Diamonds*, Grains of Tin, and other adventitious Bodies, plainly of a different Texture and Colour from the Cruſts which ſurround them; ſo that Incruſtations muſt be cautiouſly diſtinguiſhed from the entire Sheaths, or Laminæ, which compoſe the Column of hexagonal Cryſtals, and which are really form'd at the ſame time with that Column (13); whereas Incruſtations are additional, and after Concretions made on the before ſettled original Grains and Columns, (14) ſometimes theſe Incruſtations, are but Sprink-

(12) Cockle is a black, ſhining, light Stone, free of all Metal, different from Mock-Lead, common in the Tin Mines of *Cornwall.*

(13) See p. 274. Note 26.

ings of the cryſtal Drops, without any Continuity, or mutual Contact; and in this Caſe, when the pearly Drops are themſelves bright and tranſparent, and the Stone they fix on, of an Agate Colour, or any lively Oppoſition, the Incruſtation is exceedingly beautiful. On one ſhotten bliſter'd Spar, I find the Incruſtation white, not pellucid, flowing in parallel Threads by each other (*Fig.* 2. TAB. V.), in ſeveral Places paſſing from one Tubercle to another, without touching the interſpers'd Hollows; by which I conclude, that this Spar was fixed on the perpendicular Side of a Fiſſure; that the Juice of this Incruſtation was of the *Stalactites* Kind, and, proceeding from the ſame Cauſe, deſcended in a ſimilar Direction.

Fig. 3. TAB. V. Is a Bunch of ſemi-pellucid Spar, ſhot into reclined Cones, making an Angle of 30 Degrees, with the Surface of the Stone; the Sides of theſe Cones are a very curious Fretwork of little Spires or Briſtles, many of them ſharp as the ſmalleſt Needle, and pointing nearly in the ſame Direction, as the Cone on which they riſe. The Surface of theſe Shoots is of a ferrugineous Tint, but their inner Subſtance pellucid, very little ſhort of that Spar, which for its Clearneſs is called Cryſtal, and

(14) Incruſtations are ſo many evident Proofs of Stones not being formed all at the ſame Time; for many *Corniſh Diamonds*, and columnar Shoots of Tin, Cubes of Mundic, and Grains of Lead are often broke off from theſe their Incloſures; but the angular Cavities, with their ſtrait Edges and ſmooth Sides, ſtill appear in the Incruſtation; which plainly ſhews, that the Diamonds and Tin Shoots, *&c.* were firſt form'd and harden'd, and then ſurrounded and united into one Lump, by a ſucceſſive Induration of theſe Cryſtal or Spar Cruſts.

and more tranſparent than many hexagonal Shoots; 'tis the only one I have ſeen of its Kind.

Fig. 4. TAB. V. Is an Aſterisk of the cleareſt Spar; its Shoots or Rays are hexagonal, ſwelling, or gibbous, in the Middle; their Sides not plain, or of one level Surface, as our *Corniſh Diamonds* generally are, but ridg'd near the Edges, and ſomewhat hollow, but not uniformly, in the Middle; the Points or Terminations were entire and ſharp, but not to that Degree aculeated as the former conic Spar; but it is very plain, that theſe Spires never had any hexagonal Apices: The undermoſt Shoots ſpread horizontally; but the other riſe gradually, making a greater Angle, till the middle ones make nearly a right Angle with the Baſe, which has a ferrugineous circular Spot in the Middle, from whence the Rays regularly proceed on every Side. *Fig.* 5. TAB. V.

Theſe are ſome of the moſt ſingular Spars which have reach'd my Obſervation; but the general Shape of our figur'd Spars is hexagonal; and theſe Hexagons either conſiſt of a Shaft or Column, and a Point with the ſame Number of Sides correſpondent to the Column (*Fig.* 6. TAB. IV.) or are only Points, that is, pyramidal Hexagons ſtuck on at their Baſe, upon the Surface of their ſtony Beds. *Fig.* 7. TAB. IV.

In a thin Cake or Lump in my Poſſeſſion, one Half of the Spar ſhoots from one Side, the other Half from the other; and ſo incruſts the Planes of both Sides with hexagonal *Apices*. *Fig.* 8. TAB. IV.

Here the Spar (as appears by the Tendency of its Fibres, when the interior Texture is examin'd) ſtruggled to form Stems or Stalks to theſe *Cuſpides*; but either the Effort was not vigorous enough, or, through the Impurities of the Juice, the ſparry or

cryſtalline Principles had no room to extend or protrude themſelves into the Shape they ſeem inclinable unto; ſo they lie blended, and their Lineaments ſcarcely to be diſtinguiſh'd from the general Maſs.

Some Spars riſe out of the general Surface, into large orbicular Bliſters, thick ſet with hexagonal Points diverging, as Rays from a Center. *Fig.* 9. Tab. IV.

Theſe Bliſters or Protuberances are in other Spars ſubdivided into Numbers of other ſmall, orbicular Excreſcencies, and the *Cuſpides* very ſmall, but, like the pointed Shoots of moſt *Corniſh* Spars, hexagonal. *Fig.* 10. Tab. IV.

At the Root, or where they join to the Rock, theſe globular Maſſes ſhew in what Direction the Juice exerted itſelf, ſpringing commonly, as from one general Center, and extending itſelf equably on every Side. When the Juice is ſimple, and of one Sort only, the Rays are continued from the Center to the Extremities; as *Fig.* 11. Tab. IV. But when the Juice is of two or more different Mixtures and Impregnations (which will generally appear from the different Colours and Degrees of Tranſparency), then the Effort is various and ſucceſſive, protruding the Juice according, and in proportion to the different Activity of the *Stamina*, of which it conſiſts; and in both theſe Caſes I find the coarſeſt and moſt terrene Part of the ſparry Lump next the Center, and the moſt tranſparent and pureſt ſhot forth, to form the pyramidal *Cuſpides* of the Circumference. Though the Effort is various and multiple, the ſeveral Juices preſerve a Parallelism to each other, and to the Extremity, each Juice proceeding no farther than its own

own Impregnation would carry it; and therefore ſettling in parallel Liſts or Lines behind each other, and their Angles leſs and leſs perfect, that is, becoming more obtuſe, till you come to the Rock, or lifeleſs Lump of Spar, which the Effort had no Power to move, and thro' which the impregnated and purer Juices eſcaped, according to their Degree of Mobility: The Baſe of one of theſe orbicular Lumps, which has ſeven diſtinct Liſts or Fillets one within the other, beſides leſſer Liſts, mark'd (*h*), will explain what is here ſuggeſted. *Fig.* 12. TAB. IV. ‡

Theſe hexagonal Points do not always ſit cloſe to the Body of the Rock, but are as often found mounted upon columnar Shoots of the ſame Number of Sides; and theſe are what are commonly called *Corniſh Diamonds*: They are generally found larger ſomewhat at the Baſe, where they faſten on the Rock, than at the Top, where they ſupport the *Cuſpis*. *Fig.* 13. TAB. IV.

Some of theſe Shoots have alſo hexagonal Points at each End, as *Fig.* 14. TAB. IV. and are ſometimes found ſingle, that is, detach'd, and without a Root, as the Naturaliſts ſay; but I have them alſo in Lumps fixed Side by Side, but in no parallel Direction. *Fig.* 15. TAB. IV. (15).

This

‡ *a*. The cleareſt Cryſtal.
b. Sup-pellucid, inclining to purple.
c. Flock-white, not pellucid.
d. Large Fillet of purpled Spar.
e. Flock-white.
f. Small Fillet of purpled Spar.
g. Flock-white.
h. Liſts of Spar leſs diſtinct.
i. That Side on which the Effort was faint, and the Shoots ſcarce perceivable.

(15) Theſe Shoots are not always ſtrait, but are found ſometimes bent or crooked; but as this Deformity is owing to ſome accidental inter-

This is the general and moſt common Appearance of our *Corniſh* figur'd Spars and Cryſtals, *viz.* either hexagonal Points on the Rock, or common Spar, or fixed on Shoots or Columns of the ſame Figure; but we muſt not imagine, that Spar aſſumes no other Shape, but what has been here mentioned. There are alſo trigonal and cubical Spars; but of theſe Sorts I have not yet ſeen any in *Cornwall*; however, as our Obſervations in this inquiſitive Age are daily growing more extenſive, it is very probable, that new and undeſcribed Shapes of Spars may often fall under our Notice: What I have here mentioned ſeem moſt worth notice; but to pretend to number them all, would be very extravagant; for they are varying every Day upon our Hands, and new Mines throw forth new Forms, according to the different Combinations of their Solids, and the Impregnation of their Waters.

Sect. 4.

Whence the hexagonal Shape of Spars.

It has been obſerved before, (*p.* 257.) that Water and the ſparry Juice, conſidered ſimply, without any other Aid, will produce only the irregular, ſhapeleſs Maſſes of Spar, incapable of any Activity, or Struggle towards Shape and Figure, and determined only by the common Principle of Gravitation, to that Poſition in which we find it: We muſt call

---

interpoſing Force or Obſtruction, during the Time of forcing, it will not, I apprehend, make the Body of a different Species, as long as all the other common Properties are continued.

call in therefore the Aſſiſtance of ſome other Principle, to account for the rectilineal regular Phænomena of theſe ſparry Productions.

As the general Appearance of our *Corniſh* Spars is hexagonal and uniform, there muſt be ſome one general Principle to which this great Uniformity is to be referred. If theſe Spars owed their Form to any metallic Principle, that Metal would be found, when the Fluor was thrown off by Fire: But the contrary is apparent, the cleareſt Spars yielding no Metal. And, indeed, it may here be obſerved, that when the ſtony Juice meets and coaleſces with any metallic Particles, that Juice ſhoots not into its natural Form, but by Tin is forced into Priſms, and various *Speculums*; by Lead, into Cubes; and by other Metals into other Forms: So that it never retains its hexagonal Shape, but when free of Metals. As therefore there is no Metal in our regularly-figur'd Spars, we muſt have recourſe to another Origination; and Salt, as I take it, is moſt likely to be that active Principle, by whoſe Force the Fluid in which it is mix'd, be it pure Water, or lapideous Juice, is made to ſhoot forth into regular rectilineal Maſſes, agreeable to the original Shape and Figuration in which theſe Salts were firſt created. 'Tis by the Force of Salts that liquid Bodies are thrown into all the geometrical Planes, Angles, and more compounded Shapes, the Variety of which is no leſs ſurpriſing, than the Conſtancy and Uniformity of each particular Species; the ſame Salt ſhooting ſtill into the ſame Figure (as is plain from all artificial Cryſtallizations), when not ſtreightened in Room, or otherwiſe determined by heterogeneous Mixtures. To produce Salt

from any liquid Body, two things are requiſite: Firſt, that the redundant Liquor, in which the ſaline Particles are kept too diſperſed and remote to attract each other, be diſcharged (which is uſually performed by Evaporation), and that the Remainder be expoſed to a colder Air. This ſimple plain Proceſs will produce all the Varieties of Cryſtallization; the Salts contained will ſhoot into their peculiar Forms, pointing forth their Darts, regular Planes, or Spires, into ſuch Figures as are proper either to their native or compounded Salts. From this eaſy and inconteſtable Procedure of Liquids into figur'd and ſolid Bodies (to which nothing more is required than Heat and Cold), may it not appear probable, that ſomething like this has happened, and does ſtill happen, among our Spar-Loads in the Mine? For Inſtance: When the Juice of Spar, impregnated ſtrongly with Salts, which have been from time to time imbibed, is ſufficiently drained from the Water (which not only collected the ſparry Maſs, but kept it in a fluid State), either by natural Heat, ſo common in Mines, or by the Water's running off into Crevices, where the ſtiffer Stone-juice cannot follow it; in other Words, when the Water deſerts the Spar; the Spar, as ſoon as a colder Air ſucceeds (16), ſhoots, and is protruded into Figures by the Salt which it contains (17); and thus

(16) "*Cryſtallus eſt ſuccus, quem frigus intra terram conglutinavit.*" Agric. p. 282.

(17) Mr. *Boyle*'s Opinion is, that ſuch Stones (*viz.* Spars and Cryſtals) were originally in a fluid State; that the Figure of them is determinate and geometrical, like the Cryſtals produced by Alum, Nitre, Vitriol, in Water; and their Texture like the Congelations of Salt produced in Cryſtallization by Cold.

Grew

thus it happens that we have ſuch figur'd Bodies from the Spar, which, without thoſe Salts, would ſhew us no ſuch Shoots as we call *Corniſh* Diamonds, but fix quietly into Sheets, and even Plates, or drop down where-ever its own Weight would carry it.

What ſort of Salt it is, which inclines Spar to this hexagonal Form, is the next thing to be inquired into; and moſt probably will appear to be that of Nitre, if we conſider that the Reſemblance betwixt the Figure of what we call *Corniſh* Diamonds, and that of the pure unmix'd Nitre, is ſo great, that no two things can be more exactly alike. " The known Figure of " Nitre, ſays *Grew* (*Coſmol. p.* 15.) is a ſexangular " Priſm." " Particulas nitri *Liſterus* deprehendit " ſexangulas, tenues, longas, lateribus parallelo- " grammis, & ex altera parte in pyramidale acumen " deſinentes." *Phyſ. Cler.* 8*vo*, *tert. Edit. p.* 150. This exact Reſemblance is ſufficient to make us conjecture, that theſe ſparry Productions may owe their general Figure to a nitrous Salt, which exerted itſelf at the time when the Juice of Spar became Stone; and I ſhall endeavour to ſupport this Conjecture only by one Authority, which is that of the curious, and, in the Studies of Natural Hiſtory, indefatigable *Linnæus*, which he favoured me with in Anſwer to ſome Queries, jointly with the Opinion of the preſent Dr. *John Frederick Gronovius* of *Leyden*. " The Origine of " thoſe Cryſtals (18) is a moſt intricate thing; but " you may conclude---*quod omnis cryſtallizatio a*

" *ſale*,

Grew (*Coſmol. p.* 14.) after talking of the Regularity of Forms, and the Salts of Bodies, proceeds thus: " Arguing (ſays he) that the Atoms " of the lapidific, as well as of the ſaline Principle, being regular, do " therefore concur in producing regular Stones."

(18) *Corniſh* Diamonds, ſent to Dr. *Gronovius* from *Cornwall*.

" *ſale, quod cryſtalli gaudent figura nitri, quodque*
" *omnes generentur in cavo: Hi (viz. cryſtalli) quo*
" *magis ſimplices, eo magis puri & pellucidi: Hinc*
" *nitro originem debent, quemadmodum gemmæ iſtæ,*
" *quæ priſmaticam nitri figuram exhibent.*"

As Nitre may be reaſonably conjectured to give the ordinary and general hexagonal Figure to Cryſtals, it may be as juſtly inferred, that when they depart from this Uniformity, it is owing to ſome mineral, earthy, or metallic Mixture, ſome heterogeneous Salt, which impedes the Nitre in its ſhooting, and turns it into trigonal, cubical, conic, or other unuſual Figures.

SECT. 5.

Of their SIZE.

The next thing to be conſidered, is the Cauſe to which the different Size in which theſe Bodies do appear may be owing, Some Cryſtals are ſaid to be a Cubit high: *Livia Auguſta* dedicated one in the *Capitol* of fifty Pounds Weight (19); and Dr. *Iſaac Lawſon*, late Phyſician to the Army in *Flanders*, informed me, that he ſaw a Cryſtal in a foreign Mine, with its Edges well preſerved, which he believed might weigh about 200 Pounds. Dr. *Woodward* reckons, among his *Corniſh* Diamonds, a ſingle Column or Shoot very large, if it be three Inches in Length, and one Inch and half in Diameter near the Baſe. The largeſt I have yet ſeen in *Cornwall* weighs ſomewhat more than three Pounds, is about ten Inches in

(19) *Pliny, lib.* 37. *c.* 2. Sir *Hans Sloane* has one Block of Cryſtal which weighs between 40 and 50 Pounds, and another about 20, quite clear and regular. *C. M.*

(20) *Catal.* 158. *f.* 98.

in Girt at the largeſt End, and more than ſeven high; from which Size there are of all Degrees, down to the Bigneſs of a ſmall Pin. As the Size of this laſt-mentioned is very unuſual, I have given a Drawing of it, *Fig.* 16. TAB. V.

The largeſt proceed out of a large Courſe or Load of Spar; but the ſmalleſt of all from ſmall Bits or Lumps of Spar; and the ſmall pyramidal *Apices* are generally ſtuck on upon the Side of the large ones, ſometimes in diſtant Spangles, other times in thin and broken Incruſtations. Now the Cauſe of theſe different Sizes ſeems to be this: Where-ever great Maſſes of the ſparry Juice have happened at the ſame time to be in a State of Fluidity, the exuberant Water drained off ſuddenly, and conſequently left Cavity ſufficient for the Salts to extend themſelves, there the great Quantities of nitrous Salts mixed with the lapideous Juice incline it to ſhoot vigorouſly, and form large Cryſtallizations; and from proportionably leſſer Maſſes, whilſt they are indurating, proceed leſſer Diamonds. If the whole Maſs be impregnated with nitrous Salts, the whole Surface of the Rock ſhall riſe into Points or Spires (21), according as the Maſs is more free or more ſtubborn to comply with the Agitation. If the nitrous Salts are not intimately mixed, but ſwim in Clouds and Bunches, thoſe Lumps only, where the Nitre is, ſhall be ſhot, and the reſt be plain. This is the Caſe when the ſparry Juice gets into its proper *Nidus*, or reſts in its Fiſſure. But where ſmall ſcatter'd Quantities of this ſtony Juice circulate in the ſubter-

(21) See *Fig.* 4. and *Fig.* 3. TAB. V. and *Fig.* 8. and 11. TAB. IV.

ſubterraneous Waters, ſome trickle down the Sides of Stones and Fiſſures, and already-formed Diamonds, and, ſticking in *little* Globules, form a Cruſt by Juxtapoſition, whoſe Points are ſexangular, their Columns ſhort, ſometimes crooked and unfiniſh'd. At other times Water, charged with theſe ſparry Juices, falling from higher into lower Parts of the Mine, cannot but be daſhed and diſperſed about the Cavity in all Directions; and thus it is, perhaps, that the diſtant Spangles, like the Dew or Miſt that riſes from a Caſcade ſprinkled on the Surfaces of all Bodies in their Reach, are there congealed, and ſhot by their Salts.

SECT. 6.

Of their COLOUR.

Spars are of different Colours, and different Degrees of Tranſparency; ſome yellow, ſome reddiſh, brown, green, purple, black, ſome of a cloudy fleecy white, ſome freckled with little Specks of various Colours and Magnitudes, and others of a Water not inferior to the pureſt Cryſtals. The Yellow is ſuppoſed to be indebted for its Tinge to Sulphur and Iron, or Lead, or both; the Red to Iron, and perhaps *Goſſan*, that general Companion of Copper; Green, to the Solutions or Ruſt of Copper; Copper will alſo probably impart its Purple (for of that Colour we find ſome of our moſt beautiful Copper Ores) to the Juices near it: Black may poſſibly be indebted to Copper alſo of like Colour, to Tin, or the Particles of Coal; but the moſt tranſparent owe that Advantage to the Purity and Simplicity of the Juices of which they are formed. What this Purity is owing

to, cannot be ſo eaſily determined. Some think to Percolation, or ſtraining through the Pores of other Bodies, the lapideous Juice depoſiting the Sediment and Impurities, which it may have contracted in its Paſſage. Now, it is not impoſſible but that the Water, and that liquid Spar, of which theſe Bodies are principally formed, paſſing by their own Weight thro' a ſoft, porous, ſandy Stone in the *Oxford*, *Bath*, and other-like Quarries, may undergo a Change for the better, and acquire a greater Degree of Tranſparency; but it cannot be ſo with our Spar, on which we find the Cryſtals above-mentioned: For, beſides that theſe Cryſtals are found on both Sides the Stone (22) (which, in the Procedure of Percolation, could never happen), and in very large Shoots, our Spar will no more tranſpire or exude than Glaſs, it is of ſuch Conſiſtency and Hardneſs: So that whatever Filtration has happened to theſe Cryſtals, muſt have befallen them during a former Percolation, before they reſted in their preſent Beds, not from any ſweating thro' that Bed in which we find them, as Dr. *Plot* imagines (23).

Cryſtals therefore, it is certain, owe their Tranſparency and Purity to the ſimple State of the Juices that form them; but to what that State and Condition is owing is uncertain. Whether it may be to ſome purifying Menſtruum or Spirit, that precipitates every kind of Sediment, I do not preſume to ſay: I ſhall only obſerve, that in *Cornwall* the cleareſt Diamonds are for the moſt part found in a dry, lax, ſandy Soil, where

(22) See *Fig.* 8. TAB. IV.

(23) *Oxfordſh.* p. 98. and *Ramundus in Alonzo Barba*, p. 36.

where no dirty or dark-colour'd Loam, Mineral, or opaque Stones prevail: So we may conclude in general, that if, during the Fluidity of theſe Bodies, no metallic or mineral Fume, no Duſt, Clay, or Sand, was imbibed, the Water and lapideous Juice make up a clear pellucid Maſs. If the Caſe was otherwiſe, whatever Impurities the Waters contracted, and had not at the time of forming diſcharged, are ſtill to be ſeen in the Stone.

Sect. 7.

Of their Hardness.

As to the Hardneſs of our *Corniſh* Cryſtals, all I have to obſerve is, that they cut well into Seals, when they have no Flaws: Their natural Points alſo will cut Glaſs; but not freely or deep; in which Particular they fall much ſhort of the true Diamond.

Conjectures relating to the Properties of the true Diamond.

Of this I ſhall not pretend to aſſign any other Reaſon, than that the true Diamond ſeems to have more lapideous Juice included, and more intimately and congenially united under an equal Surface, than any other Body in the World. It has alſo very little Salt in it, as Dr. *Grew* obſerves (*Coſmol. p.* 14.); and his Opinion is confirmed by its being found in ſuch ſmall Maſſes; and by its great Weight it can have little Water; both which Obſervations are ſupported by its great Reſiſtance, and almoſt Immutability in Fire: So that the true Diamond has little Salt, and little Water, conſiſting almoſt intirely of ſtony Juice concreted;

creted; to which Properties its great Hardneſs may therefore be attributed: Whereas in our Diamonds there is much Salt, and much Water (comparatively ſpeaking); which two Ingredients, mix'd with the lapideous Juice, may incline thoſe Bodies to be more friable and tender, and deprive them of that Hardneſs, which a leſs-reduced lapidific Juice would certainly have had. This ſems to me the real Cauſe of the true Diamond's Hardneſs, and of our falſe ones falling as much ſhort of it in this Particular, as in Luſtre: But I muſt acknowlege, that, for want of ſufficient Experiments relating to both, I cannot decide peremptorily. However, by weighing the *Corniſh* Diamonds in Water, I find they are generally to the Weight of our common Watter, at a Medium, as $10\frac{1}{2}$ is to 4; and I apprehend, that if they had more lapideous Particles, they would weigh more, as they find the true Diamond really does *. I find alſo the cleareſt and brighteſt *Corniſh* Diamonds weigh much heavier than the other which are more ſhady and opaque. That they have much Salt alſo, may be concluded from their being projected ſometimes into ſuch large, regular, hexagonal Columns.

Sect. 8.

Of the Texture *of* Corniſh Diamonds.

There are ſome little Varieties in the Texture of our *Corniſh* Diamonds, which are ſometimes to be obſerved in their broken Sides and Edges; but always, and more diſtinctly, in their Baſe. Some are uniform, of one Colour and Tranſparency throughout;

* The Weight of *Cryſtals* to Water is as $2\frac{1}{2}$ to 1. of *Diamonds* as $3\frac{1}{2}$ to 1. See theſe Tranſactions, No. 488. p. 451. *C. M.*

ſome have hexagonal Sheaths deſcribed one within another, as in *Fig.* 17. TAB. V. In the firſt Caſe, the ſhotten Juice was of one and the ſame Nature and Conſiſtency, equally impregnated, and the Production of one Effort; in the latter Caſe, where the Sheaths are one within another, 'tis alſo the Product of one Effort or Shoot, the Concretion of one and the ſame time, as the tremulous Undulations upon the Surface of Water, on throwing in a Stone, are all the Off-ſpring of one Force, tho' the firſt be ſtrongeſt, and the reſt gradually fainter and leſs diſtinct: But the Juices being differently mix'd, gave way to the Effort in proportion to their Senſibility of the Impregnation, the moſt agile flying off to the greateſt Diſtance from the Center, and the moſt mix'd, coarſeſt, and moſt opaque, remaining neareſt the Center (24). That this is he true Proceſs, and that thoſe different Sheaths are the Produce of one Effort or Birth, and not formed at different times, and in Succeſſion, as *Steno* and *Aldrovandus*, and ſome others, ſay (25), is plain, I think, from the two following Obſervations (26). If the Juice which forms theſe Sheaths was impregnated and ſhot at different times, it would not form in Sheaths round what appears to be the Central or Maſter-ſhoot, but would project itſelf into its natural hexaedral Figure. If it were not impregnated, but mere Spar only, without Nitre, or any other active Principle, it would form itſelf, as the Stalactites, in a pendulous undulating Direction, Drop or Wave upon Wave; and in this Caſe theſe Sheaths could never ſurround, in that neat and exact manner, the central Shoot; but

(24) See *Fig.* 12. TAB. IV. and its Deſcription, *p.* 263.
(25) See *Plot's Oxf.* p. 98. (26) See p. 259. Note (13)

but would be found only on the under Part of that Shoot, where its own Gravity would inevitably carry it: For it would be obſerved immediately, that theſe Diamonds in the Mine point forth in all Directions; which muſt conſequently prevent every unimpregnated Juice from hardening into a regular uniform Sheath.

It is alſo to be noted, that theſe Sheaths are often found broke and interrupted: But this cannot be owing to their being *Gemmæ inchoatæ & non perfectæ* (27), for the above-mentioned Reaſons, but to the Inſufficiency and Want of Juice, or to ſome accidental Impediments of Stone, Earth, or Sand, which make thoſe Breaks, and prevent it from forming a complete Sheath.

SECT. 9.

Of their DIRECTION *in the* Mine.

Not long ſince I went with a Friend or two into a Mine called *Pillion Erth*, in the Pariſh of *St. Juſt*, on purpoſe to ſurvey the *Corniſh* Cryſtals in their natural Situation. The Cave, to which we were introduced, was not much larger than a common Baker's Oven, and much of that Figure. We had two Candles with us, by means of which we ſaw the Roof, which might, in the Middle, be about five Feet high from the Floor; in the other Parts not ſo much. The Roof was the moſt ſurpriſing Piece of Fretwork imaginable, and conſiſted intirely of Spar ſhot into *Corniſh* Diamonds, of which the large one *(Fig.* 16. TAB. V.) was a Part. I could not diſcern any coveting a Poſition

(27) As *Plot*, *ibid. ut ſupra*.

exactly perpendicular to the Horizon; but in every indifferent Direction they pointed forth very plentifully of ſeveral Sizes; ſometimes in Groupes and Cluſters, ſometimes ſingle, now croſſing each other, and now ſtanding by each other with parallel Sides: Some were ſmooth, ſhining, and clear, others rough and opaque; ſome vein'd with red, like Porphyry; others ſpeckled thick with the ſmalleſt Spots of deep Purple, and a bluiſh Caſt: But the fineſt of all were thoſe which had innumerable little Diamonds or Sparks (of the cleareſt Water) ſtuck upon their Sides, and, by means of the Candle, had a Luſtre not to be conceived. We gazed here in this incommodious, but beautiful little Cave, till we could no longer hold up our Heads; and then crept out as we came in, upon our Knees.

Now, among the great Numbers of ſparry Productions which I ſaw in this Mine, I could not obſerve, but that they pointed indifferently in all manner of Directions; which I ſuppoſe owing to the great Unevenneſs of the Surface on which the Baſes of theſe little Columns were fix'd; and for the ſame Reaſon I doubt not, but in all concave Beds the Points converge, as in all convex they turn the contrary Way, and diverge, as from a Center: So that the natural Cauſe of theſe different Directions is probably no other than the accidental Form of that general Maſs from whence theſe Shoots proceed. I would ſay, that as the Figure and Regularity of the lapidific impregnated Matter happens to be when drained of all ſuperfluous Moiſture, and by the Cold, Heat, or Dryth, diſpoſed to ſhoot, ſo will the Tendency of the Shoots, both Column and Point, be. If the

the concave Part (for Inſtance) of the *Voluta* of the *Cornu-ammonis* be ſet with Cryſtals, their Points muſt tend inwards to the Center, where the Tail ends, being thereto compelled by the regular Contour of the Shell; and indeed they are ſo in Fact, as ſee *Fig.* 18. TAB. V. But if the Cryſtal Juice chance to fix on, or proceed from a convex Bed (to which its *Nidus*, and other Cauſes, may contribute), or be itſelf an orbicular Lump, and equally impregnated on all Sides; then will the Fibres ſpring as from one common Center, and at their Extremities point forth their *Cuſpides* in a circular Figure, as in *Fig.* 19. * TAB. V.

If there be a thin Plate of Spar equally expoſed to Cold on each Side, and having equal Room and Force to ſhoot, it will throw forth its Points on each Side; and the Line from whence the Fibres began to ſpring ſhall be exactly in the Middle of ſuch Plate of Spar, and the Figures ſhall cut the ſaid Line at right Angles, as in *Fig.* 8. TAB. IV. whence it ſeems reaſonable to conclude, that the Direction in which theſe ſparry Productions ſhoot forth is generally rectangular, or very near it, to the Beds or Maſſes from which they proceed; and that all the ſeeming Confuſion in Pointings of the *Corniſh* Diamonds in *Pillion Erth*, was owing to the great Variety of Planes and Surfaces, into which that large Body of Spar was hardening, when theſe Diamonds ſhot from its Extremities.

I am, Sir,

Ludgvan, Oct. 18. 1749. *Your moſt obedient Servant,*

WM. BORLASE.

* See *Fig.* 5. *p.* 261.

XV.

XV. *A Deſcription of the* Great Black Waſp, *from* Penſylvania, *as communicated from Mr.* John Bartram *to Mr.* Peter Collinſon, *F. R. S.*

Read Dec. 21. 1749. SOME Time ago, ſome Gentlemen preſent at a Meeting of the Royal Society *, were pleaſed to give a favourable Reception to an Account of a particular Species of ſmall Black Waſp, that fabricated its Neſt with Clay, in it depoſited an Egg, and then ſtuffed it full of Spiders for the Maggot to feed on, *Tranſ.* No. 476.

This that I now have the Pleaſure to lay before you, has ſomething analogous in its Nature, but is a much larger Inſect, and rarely met with in the Province of *Penſylvania*. The following Obſervations I have collected from my ingenious Friend *John Bartram*'s Letters.

You will ſee by the Specimen (TAB. IV. *Fig.* 20.), the Size of this *Great Black Waſp*; it ſupplies itſelf with Food, by roving about the Meadows, catching Graſhoppers, and other Inſects; on theſe it feeds, and not on Fruits, as other Waſps do.

But what is more remarkable, is the Method of making their Neſts, and providing for their young.

With great Pains and Induſtry they ſcratch an horizontal Hole, near an Inch Diameter, and a Foot long, in the ſteep Side of a Bank of loamy Earth; then away the Waſp flies, and catches a large Green

* *April* 25. 1745.

Green Graſhopper, and lodges it in the farther End of her Neſt; then ſhe lays an Egg, and then goes and catches two more, and depoſits them with the other, then plaiſters up the Hole. The Egg ſoon produces a Maggot. Theſe Graſhoppers, by marvellous Inſtinct, are provided for its Food, until it changes into its Nymph State, in which it lies for a certain Period, and then eats its Way out, and flies away, ſeeking its Mate.

But what may deſerve our farther Attention, is the wonderful Sagacity of this Creature, not only in catching theſe large Graſhoppers (*See* TAB. IV. *Fig.* 21.), which are very like ours, and are very ſtrong and nimble, as moſt may have obſerved that take them up: But their peculiar Skill is to be admired in diſabling them, either by Bite or Sting, ſo as not to kill them; for then they would ſoon putrify, and be unfit for Nouriſhment. Life ſufficient is left to preſerve them for the time the Maggot is to feed on them.

The three Graſhoppers in the Glaſs-Caſe were all taken alive out of one Neſt; but they had loſt their Agility: Being ſecured in a Cavity in the Earth, may be a Means to keep them living: When expoſed to the Air, they died in a Day or two.

The Sting of this Waſp is painful, but does not ſwell like others.

XVI. *An Obſervation of an* Eclipſe *of the* Moon, Dec. 12. 1749. *made at* Earith, *near* St. Ives, *in* Huntingdonſhire, *by Mr.* Wm. Elſtobb, *jun. communicated in a Letter to* Martin Folkes, *Eſq*; *Pr. R. S.*

Read Dec. 21. 1749.

AT 7 at Night the Umbra came on the lower Limb of the Moon, almoſt directly under the Spot called *Tycho*, in *Keil*'s Map of the Moon.

At 2 Min. $\frac{3}{4}$ after 7, the Penumbra overſpread *Tycho*.

At 6 Min. after 7, the Umbra approached the lower Part of *Mare Humorum*, and *Tycho* immerged into the Umbra.

At 21 Min. after 7, *Mare Humorum* totally immerged into the Umbra.

At 41 Min. after 7, the lower Part of *Mare Nectaris* immerged into the Umbra.

At 57 Min. after 7, the North-Eaſt Limb began to evolve itſelf; and that Part of the Limb below the Spot called *Grimaldus*, began to appear brighter, than when the Penumbra covered it.

At 9 Min. after 8, the upper Part of *Mare Humorum* emerged from the Umbra.

At 21 Min. after 8, *Mare Humorum* totally emerged.

At 45 Min. $\frac{1}{2}$ after 8, *Tycho* emerged from the Umbra.

At 51 Min. $\frac{1}{4}$ after 8, the Penumbra left *Tycho*.

At

At 54 Min. $\frac{1}{2}$ after 8, *Mare Nectaris* emerged from the Umbra.

At 9, the Penumbra left *Mare Nectaris*.

At 4 Min. $\frac{3}{4}$ after 9, *Mare Fecunditatis* emerged from the Umbra.

At 16 Min. after 9, the Umbra left the Moon a little below *Mare Fecunditatis*.

At 18 Min. after 9, the Penumbra went off, and the Eclipſe ended.

At the Time of the greateſt Obſcuration, the Edge of the Umbra paſſed below *Grimaldus*; approached the lower Part of *Peninſula Fulgurum*; paſſed over the upper Part of *Mare Nectaris*, and croſſed about the Middle of *Mare Fecunditatis*. The Edge of the Umbra did not ſeem to make one regular Curve, but looked like two Curves, meeting in a very obtuſe Angle near *Peninſula Fulgurum*. And that Part of the Moon, immerſed in the Umbra, was not viſible.

XVII. *A Catalogue of the* Immerſions *and* Emerſions *of the* Satellites *of* Jupiter, *for the Year* 1751. *of which there are* 172 *of the Firſt,* 87 *of the Second,* 62 *of the Third, and none of the Fourth, by reaſon of its great Latitude; in all* 321. *Computed to the Meridian of* London *from the* Flamſteedian *Tables: Corrected by* James Hodgſon, *F. R. S. Maſter of the Royal Mathematical School in* Chriſt's-Hoſpital.

ECLIPSES *of the firſt Satellite of* JUPITER.

Emerſions.				Emerſions.				Emerſions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
JANUARY.				19	4	42	14	5	21	30	17
				20	23	10	49	7	15	59	18
1	11	58	56	22	17	39	31	9	10	28	20
3	6	16	58	24	12	8	12	11	3	57	27
5	0	55	4	26	6	36	56	12	23	26	35
6	19	25	17	28	0	5	46	14	17	55	41
8	13	51	35	29	19	25	35	16	12	24	53
10	8	19	52	31	14	3	27	18	6	54	01
12	2	48	15					20	1	23	14
13	21	16	40	FEBRUARY.				21	19	52	30
15	15	45	6	2	8	32	25	23	14	21	54
17	10	3	41	4	3	1	17	25	8	51	1

ECLIPSES *of the first Satellite of* JUPITER.

Emerſions.			
D.	H.	M.	S.
27	3	20	20
28	21	49	40
	MARCH.		
2	16	19	0
4	10	48	19
6	5	17	38
7	23	46	59
9	18	16	20
11	12	45	40
13	7	15	2
15	1	44	22
16	20	13	45
18	14	43	5
20	9	12	25
22	3	41	38
23	22	10	41
25	16	39	40
	Immerſions.		
24	18	52	50
26	13	21	11
28	7	49	23
30	2	17	44

Immerſions.			
D.	H.	M.	S.
31	20	49	59
	JUNE.		
	Immerſions.		
2	15	14	23
4	9	42	20
5	5	10	46
7	22	39	12
9	17	6	50
11	11	35	0
13	6	3	7
15	0	31	21
16	18	59	29
18	13	27	42
20	7	54	46
22	2	23	57
23	20	52	7
25	15	20	5
27	9	48	31
29	4	16	44
30	22	45	2
	JULY.		
2	17	13	21
4	11	41	39

Immerſions.			
D.	H.	M.	S.
6	16	10	4
8	0	38	28
9	18	6	53
11	13	35	21
13	8	3	49
15	2	34	10
16	21	0	51
18	15	29	25
20	9	58	9
22	4	26	39
23	22	55	20
25	17	24	3
27	11	52	46
29	6	21	27
31	0	50	15
	AUGUST.		
1	19	19	3
3	13	47	53
5	8	16	46
7	2	45	39
8	21	14	32
10	15	43	29
12	10	12	30
14	4	41	26

ECLIPSES *of the first Satellite of* JUPITER.

Immerſions.			
D.	H.	M.	S.
15	23	10	29
17	17	39	30
19	12	8	33
21	6	37	36
23	1	6	40
24	19	35	46
26	14	4	53
28	8	34	0
30	3	3	7
31	21	32	13
SEPTEMBER.			
2	16	1	15
4	10	30	29
6	4	59	32
7	23	29	24
9	17	57	44
11	12	26	52
13	6	55	57
15	1	25	2
16	19	54	9
18	14	23	12
20	8	52	14
22	3	21	19
23	21	50	19

Immerſions.			
D.	H.	M.	S.
25	16	19	17
27	10	48	20
29	5	17	18
30	23	46	17
OCTOBER.			
2	18	15	9
4	12	44	7
6	7	13	0
8	1	41	53
9	20	10	38
11	14	39	27
13	9	8	17
15	3	36	57
16	22	5	39
18	16	34	21
20	11	2	56
22	5	31	32
24	0	0	5
25	18	28	38
27	12	17	7
29	7	25	40
31	1	54	6

Immerſions.			
D.	H.	M.	S.
NOVEMBER.			
1	20	22	55
3	14	51	4
5	9	19	27
7	3	47	15
8	22	15	24
10	16	43	53
12	11	11	42
14	5	39	54
16	0	7	56
☉ ♀ ♂			
Emerſions.			
21	9	40	59
23	4	9	10
24	22	37	32
26	17	4	9
28	11	32	50
30	6	0	51
DECEMBER.			
2	0	28	42
3	18	58	48
5	13	24	34

ECLIPSES *of the first Satellite of* JUPITER.

Emerſions.				Emerſions.				Emerſions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
7	7	52	22	16	4	12	3	25	0	21	57
9	2	20	43	17	22	40	1	26	18	59	55
10	20	48	26	19	17	8	10	28	13	28	58
12	15	15	47	21	11	35	58	30	7	55	59
14	9	44	10	23	6	3	57				

ECLIPSES *of the ſecond Satellite of* JUPITER.

Emerſions.				Emerſions.				Emerſions.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
				FEBRUARY.				6	19	41	36
JANUARY.				2	19	48	12	10	9	1	4
				6	9	7	7	13	22	20	42
1	20	6	0	9	22	25	01	17	11	40	30
5	9	23	14	13	11	45	04	21	0	59	51
8	22	40	48	17	1	4	8	24	14	18	56
12	11	58	24	20	14	23	43				
16	1	15	56	24	3	43	5	MAY.			
19	14	34	20	27	17	2	22	Immerſions.			
23	3	52	36					23	22	2	48
26	17	11	1	MARCH.				27	11	19	37
30	6	29	38	3	6	22	14	31	0	36	50

JUNE.

Eclipses *of the second Satellite of* Jupiter.

Immerſions.			
D.	H.	M.	S.
	June.		
3	13	54	52
3	7	11	31
10	16	30	0
14	5	46	11
17	19	4	27
21	8	20	52
24	21	38	16
28	10	55	39
	July.		
2	0	14	1
5	13	30	24
9	3	48	55
12	16	5	36
16	5	23	15
19	8	41	2
23	7	59	5
26	21	17	9
30	10	35	19
	August.		
2	23	54	11
6	13	12	21

Immerſions.			
D.	H.	M.	S.
10	2	31	16
13	12	51	4
17	5	9	7
20	18	28	1
24	7	46	58
27	21	6	4
31	10	25	6
	September.		
3	23	44	10
7	13	03	9
11	2	22	11
14	05	41	10
18	15	42	15
21	18	19	5
25	7	37	55
28	20	56	36
	October.		
2	10	15	24
5	23	33	56
9	12	22	14
13	2	10	43
16	16	38	56
20	4	37	1
23	18	4	56

Immerſions.			
D.	H.	M.	S.
27	7	22	45
30	20	40	40
	November.		
3	9	58	16
6	23	15	13
10	12	32	37
14	1	49	26
	Emerſions.		
17	17	42	51
21	6	59	44
24	20	17	2
28	9	33	14
	December.		
1	22	49	58
5	12	06	40
9	1	23	45
12	14	40	6
16	3	56	48
19	17	13	40
23	6	30	28
26	19	47	10
30	9	4	19

January.

ECLIPSES *of the third Satellite of* JUPITER.

D.	H.	M.	S.	
		JANUARY.		
4	5	16	46	I
4	7	27	2	E
11	9	16	59	I
11	11	27	11	E
18	13	17	29	I
18	15	27	37	E
25	17	28	42	I
25	19	28	46	E
		FEBRUARY.		
1	21	20	41	I
1	23	30	41	E
9	1	23	10	I
9	3	33	14	E
16	5	26	12	I
16	7	36	20	E
23	11	40	53	E
		MARCH.		
2	15	43	17	E
9	19	47	23	E
16	23	50	57	E
24	3	54	24	E

D.	H.	M.	S.	
		MAY.		
20	9	57	33	I
27	13	56	47	I
27	16	10	44	E
		JUNE.		
3	17	55	27	I
3	20	10	11	E
10	21	54	12	I
11	0	9	22	E
18	1	52	44	I
18	4	8	20	E
		JUNE.		
25	5	51	28	I
25	8	7	32	E
		JULY.		
2	9	50	44	I
2	12	6	54	E
9	13	50	19	I
9	16	6	37	E
16	17	50	21	I
16	20	6	49	E

ECLIPSES *of the third Satellite of* JUPITER.

D.	H.	M.	S.	
23	21	51	53	I
24	0	7	29	E
31	1	51	54	I
31	4	8	34	E
		AUGUST.		
7	5	52	22	I
7	8	11	10	E
14	9	53	49	I
21	13	55	38	I
28	17	57	44	I
		SEPTEMBER.		
4	21	59	54	I
12	2	1	58	I
19	6	3	58	I
26	10	5	18	I

D.	H.	M.	S.	
		OCTOBER.		
3	14	7	14	I
10	18	8	15	I
17	22	10	53	I
25	2	8	48	I
		NOVEMBER.		
1	6	8	38	I
8	10	7	13	I
15	14	5	21	I
22	20	33	42	E
30	0	31	35	E
		DECEMBER.		
7	4	29	26	E
14	8	27	20	E
21	12	25	19	E
28	16	22	24	E

Now, inaſmuch as, in the Beginning of this Year, the Latitude of the fourth Satellite is greater than the Breadth of the Shadow of *Jupiter*, the Satellite will paſs wide of it, and there will be no Eclipſe of it till the Middle of *June* in the Year 1752.

It

It is to be obſerved, that, for about a Month before, and a Month after the Conjunction of *Jupiter* with the Sun, by reaſon of the Proximity of *Jupiter* to the Sun, the Eclipſes cannot be obſerved. And this is the Reaſon that no Notice has been taken of them in the Catalogue between the 25th of *March* and the 24th of *May* following.

The Times here ſet down are according to the aſtronomical Way of reckoning, which ſuppoſes the Day to commence at the Noon of each Day, or when the Sun is upon the Meridian; and counting the Time on in a ſucceſſive Order, without the Diſtinction of Morning and Afternoon, til the Sun returns to the Meridian again the next Day at Noon. Thus, for Example, in the preceding Catalogue, the firſt Emerſion of the ſecond Satellite is ſaid to happen on *January* 1. at 20 Hours 6 Minutes; that is, according to the Civil Way of reckoning, on *Jan.* 2. at 6 Minutes after 8 in the Morning.

XVIII. *A Letter from the Widow of the late Mr.* John Senex, *F.R.S. to* Martin Folkes, *Esq; President of the* Royal Society, *concerning the large Globes prepared by her late Husband, and now sold by herself, at her House over-against* St. Dunstan's Church *in* Fleet-street.

SIR,

Read Jan. 19. 1748-9. THE Royal Society being lately acquainted with some Improvements that were said to have been made upon the Globes at *Nuremberg*, and desired to encourage and recommend the same, I am obliged to return you my most grateful Acknowledgments for your kind Interposition in behalf of mine. It is sufficiently known, that Works of Art, made in our own Country, have, for the most part, a Degree of Exactness much superior to those of foreign Countries: And I hope I may be allowed to say in particular, and without Disparagement to the Performances of others, that my Globes will be found, upon Examination, as truly made, as accurate, and as well adapted for the Purposes of Geography and Astronomy, as any now extant. For (not to mention that the *Terrestrial* is formed from the best Maps that could be made or procured, and contains no material Error in the Situation of any Places where Observations have been really and truly made) the *Celestial*, upon the nicest Examination, will be found to have this Advantage above all others, that the Figures of the *Constellations* there given, were originally delineated by a Gentleman, whose Skill in Performances of this Nature was very well known and allowed; under the Direction of the great Dr. *Halley*, to whose Kindness my late Husband was upon all Occasions particularly indebted.

debted. And beſides this, to each Star are added *Bayer's* Letters of Reference; a Circumſtance extremely uſeful, either for the tracing out the Path of a Comet, or for deſcribing any new *Phænomenon* in the Heavens.

It may be further obſerved, that Celeſtial Globes, as they are commonly fitted up, are adjuſted only to one particular Year; though indeed they may ſerve without any ſenſible Error, during the Life of any ſingle Perſon; whereas mine, particularly the two greateſt, *viz.* of 17 and 28 Inches in Diameter, have this further Advantage, that they ſerve indifferently for any Age paſt or to come. For by means of a Nut and Screw, which will be hereafter deſcribed, the Globe is made to turn round an Iron Axle; whereby the Pole of the Equator (though fixed in common Globes) is made here to revolve about the Pole of the Ecliptic, and repreſents the ſlow Motion *forwards* obſerved among the fixed Stars, but really owing to the ſlow Motion *backwards* of the Equinoctial Points.

Upon this Account it is, that the Conſtellation of *Aries* is got into the Sign of *Taurus*, and the Conſtellation of *Taurus* into that of *Gemini*, and ſo of the reſt. Hence likewiſe it is, that Stars which roſe or ſet at particular Seaſons of the Year in the times of *Heſiod*, *Eudoxus*, *Virgil*, *Pliny*, &c. by no Means anſwer at this Time to their Deſcriptions; but by the Improvement I am here ſpeaking of, my Globes (allowing for the *Preceſſion of the Equinox*, as it is called, *i. e.* one Degree in ſeventy-two Years) may, without any Trouble, be adjuſted to the Accounts given by any of thoſe Writers.

By this means likewiſe, every one may judge of the Truth of ancient Obſervations without the Labour of a tedious *Calculus*, which ſome are not able, and others are not willing, or at Leiſure, to go through. By this means likewiſe, ſome Paſſages in thoſe ancient Writers may be corrected, when Manuſcripts afford no Aſſiſtance. For theſe frequently ſuffer by the Hands they go through, whilſt the Heavens remain invariably the ſame.

As

As by this apparent Motion in the Heavens, not only the *Longitudes*, *Declinations*, and *Right Aſcenſions* of the fixed Stars are affected, but the Poſition of the *Colures* is of Courſe altered, yet by the Help of this Contrivance all may be reſtored, and the Age of an Author, in ſome ſort, beaſcertain'd.

The famous Aſtronomical Argument likewiſe of Sir *Iſaac Newton*, in his *Chronology*, *p.*86,87, *&c.* may hereby be more particularly enquired into, and conſidered; all which Uſes will be ſpeedily ſhewn and demonſtrated by a regular Series of Propoſitions, in a Treatiſe, as I am well aſſured, that is preparing for the Preſs, by the Reverend and Learned Mr. *George Coſtard*, Fellow of *Wadham-College*, in *Oxford*.

Theſe, Sir, are ſome of the great Advantages of my Globes over others; and I therefore hope they will merit the Encouragement of a Society founded for promoting real and uſeful Learning; and that the Importation of any Globes from abroad may be rendered leſs neceſſary, if not entirely uſeleſs. I am,

With all Gratitude and Reſpect,

S I R,

London, Jan. 17. 1748-9.

Your moſt obliged,

Humble Servant,

MARY SENEX.

ERRATA.

No. 492. *In the Contents* Art. XIV. *and p.* 162. Art. XIV. *for* Mr. Richard Maſon *read* Charles Maſon, D. D.

No. 493. *p.* 213. *l.* 1. *for* ou *read* on.

PHILOSOPHICAL TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Preſent Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Conſiderable Parts of the WORLD.

LONDON:

Printed for C. DAVIS, PRINTER to the ROYAL SOCIETY, over-againſt *Gray's-Inn-Gate* in *Holbourn.*

M.DCC.LI.

PHILOSOPHICAL

Fig. 1. p. 293.

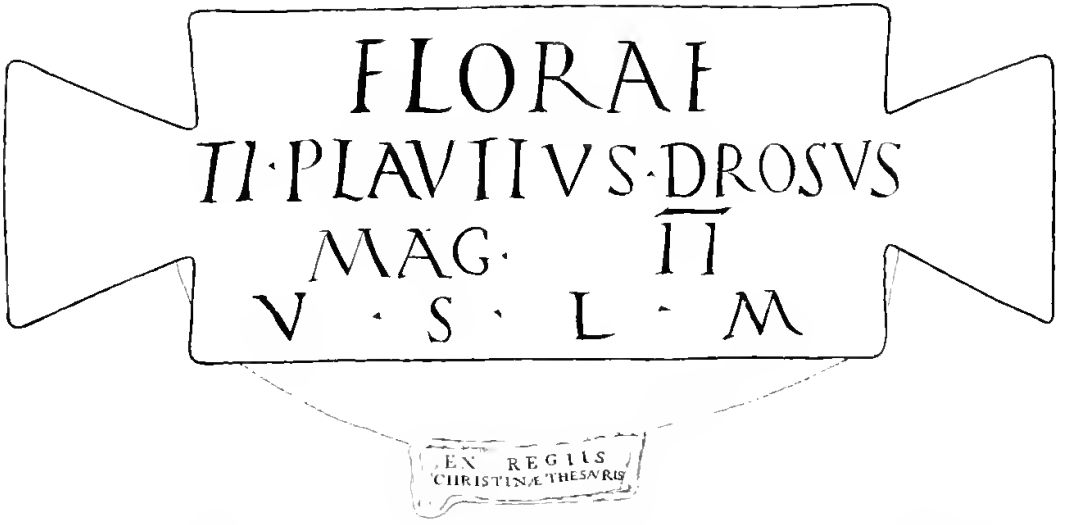


Fig. 3. p. 311.

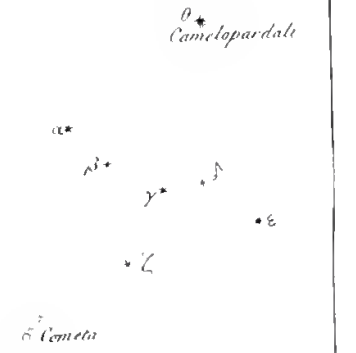


Fig. 2. p. 307.

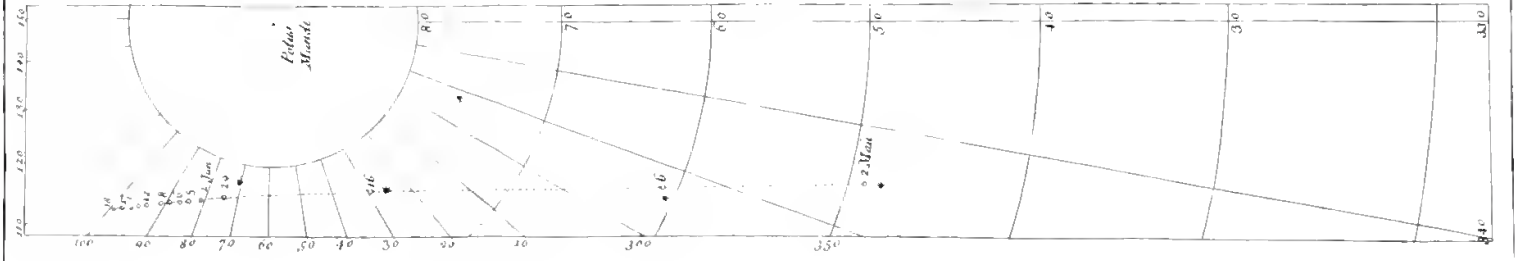


Fig. 2. p. 343. 344

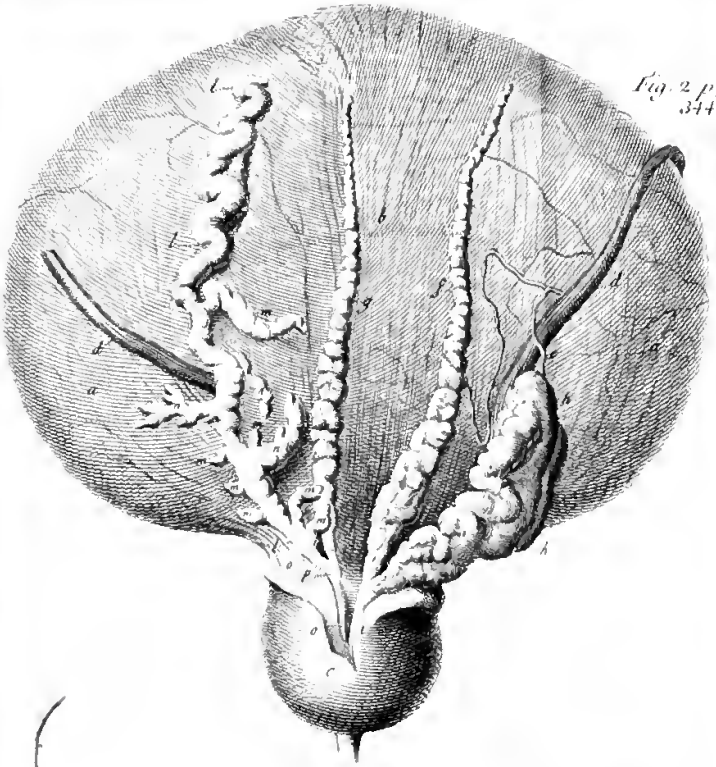
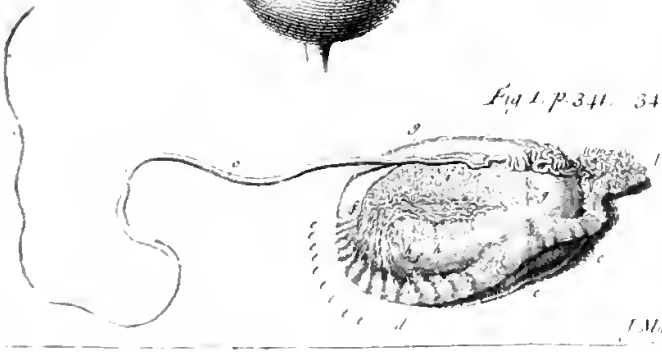


Fig. 1. p. 341. 344.



Numb. 494.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *January*, *February*, *March*, and Part of *April*, 1750.

I. *Remarks upon an antient* Roman Inſcription, *found in that Part of* Italy, *which formerly belonged to the* Sabines; *and now in the Poſſeſſion of* Richard Rawlinſon, *LL.D. & F.R.S. By Mr.* John Ward, *Prof. Rhet. Greſh. & F.R.S. p.* 293.

II. *Epiſtola a Rev. Patre P.* Auguſtino Hallerſtein, *S. J. M.* Collegii Aſtronomici Pekinenſis *Præſide, ad* Cromwell Mortimer, *M. D. Secret. R. S. miſſa, unà cum Obſervationibus* Cometæ *viſi Pekini* 1748. Novæ *Conſtellationis; Occultationis* Martis *et* Lunæ *Dec.* 6. 1747. *Conjunctionis* Martis *et* Veneris *menſe Martio* 1748. *& Congreſſûs* Jovis & Veneris *Jan.* 1. 1748. *ibidem quoque factis.* *p.* 305.

III. *Obſervatio Cometæ, Anno* 1748. *cum aliis aliquot Obſervationibus aſtronomicis a Rev. P. P.* Antonio Gaubil *e Soc. Jeſu ad eundem tranſmiſſa; in Reſidentia* PP. Gallor. *Soc. Jeſu* Pekini. *p.* 316.

IV. *An Account of an* Aurora Auſtralis, *ſeen* Jan. 23. 1749-50. *at* Chelſea, *by* John Martyn, *F.R.S.* Prof. Bot. Cantab. *communicated by* Martin Folkes, *Eſq;* Præſ. Reg. Soc. *p.* 319.

V.

V. *A Letter from Mr.* Chriſtopher Maire *to the Preſident, containing Obſervations made at* Rome *of the* Eclipſe *of the* Moon, Dec. 23, 1749; *and of that of the* Sun, Jan. 8. 1750. *p.* 321.

VI. *Some Obſervations on the* Dragon-Fly *or* Libella *of* Penſylvania, *collected from Mr.* John Bartram's *Letters, communicated by* Peter Collinſon, *F. R. S.* *p.* 323.

VII. Alberti Halleri *Archiatri & Conſil. Aul. Reg.* Medic. *in Acad.* Gottingenſ. *Prof. & Reg. Soc.* Lond. *Sodal. Experimenta aliquæ ad* Reſpirationem *pertinentia.* *p.* 325.

VIII. *A Letter from Father* Anthony Gaubil, *Jeſuit, to Dr.* Mortimer, *Sec. R. S. containing ſome Account of the Knowlege of Geography among the* Chineſe, *and of Paper-Money current there. Tranſlated from the* French *by* T. S. *M. D. and F. R. S.* *p.* 327.

IX. *A Catalogue of the Fifty Plants from* Chelſea *Garden, preſented to the Royal Society by the worſhipful Company of Apothecaries, for the Year* 1747, *purſuant to the Direction of Sir* Hans Sloane, *Bart.* Med. Reg. & Soc. Reg. *nuper* Præſ. *by* John Wilmer, *M. D. Hort.* Chelſ. *Præfect. et Prælect. Botan.* *p.* 331.

X. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to Mr.* Henry Baker, *F. R. S. concerning the green* Mould *on Fire-Wood; with ſome Obſervations of Mr.* Baker's *upon the Minuteneſs of the* Seeds *of ſome Plants.* *p.* 334.

XI. *An Obſervation of the* Eclipſe *of the* Sun *on* Jan. 8. 1750. *N. S. taken at the Obſervatory at* Berlin,

Berlin, *by M.* Griſcow *jun. and M.* Kies. *Tranſlated from the* French. *p.* 339.

XII. Alberti Halleri, *Archiatri et Conſil. Aul. Reg. in Acad.* Gottingenſ. *Medicinæ Prof. necnon R. S.* Lond. *Sodalis, Obſervationes* de Viis Seminis. *p.* 340.

XIII. *A Letter from* John Martyn, *M. D.* Prof. Botan. Cantab. & F. R. S. *to the Preſident, concerning an* Aurora Borealis *ſeen* February 16. 1749-50. *p.* 345.

XIV. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to* Henry Baker, *F. R. S. concerning an* Aurora Borealis *ſeen* Jan. 23. 1750-51. *p.* 346.

XV. *A Letter from Mr.* William Watſon, *F. R. S. to the* Royal Society, *declaring that he as well as many others have not been able to make* Odours *paſs thro' Glaſs by means of* Electricity; *and giving a particular Account of Profeſſor* Boſe *at* Wittemberg *his Experiment of* Beatification, *or cauſing a* Glory *to appear round a Man's Head by* Electricity. *p.* 348.

XVI. *Part of a Letter from Mr. Profeſſor* Euler *to the Reverend Mr.* Wetſtein, *Chaplain to his* Royal Highneſs *the Prince, concerning the Contraction of the* Orbits *of the* Planets. *Tranſlated from the* French *by* T. S. M. D. *and F. R. S. p.* 356.

XVII. *A Catalogue of the fifty Plants from* Chelſea *Garden, preſented to the Royal Society, by the worſhipful Company of Apothecaries for the Year* 1748, *purſuant to the Direction of Sir* Hans Sloane, *Bart.* Med. Reg. et Societat. Reg. *nuper* Præſ.

Præſ. *by* John Wilmer, *M. D.* Clariſſ. Societat. Pharmaceut. Lond. Soc. Hort. Chelſean. Præfect. et Prælect. Botan. *p.* 359.

XVIII. *An Account of a ſurpriſing Inundation in the Valley of* St John's *near* Keſwick *in* Cumberland, *on the* 22d *Day of* Auguſt 1749, *in a Letter from a young Clergyman to his Friend; communicated by* John Lock, *Eſq*; *F. R. S. p.* 362.

XIX. *An Account of an extraordinary Fire-ball burſting at Sea, communicated by Mr.* Chalmers. *p.* 366.

XX. *Extract of a Letter from the Abbé* Nollet, *F. R. S.* &c. *to* Charles *Duke of* Richmond, *F. R. S. accompanying an Examination of certain* Phænomena *in* Electricity, *publiſhed in* Italy; *by the ſame, and tranſlated from the* French *by Mr.* Watſon, *F. R. S.* *p.* 368

XXI. *An extraordinary Caſe of a* Fracture *of the* Arm; *communicated by Mr.* John Freke, *F. R. S. Surgeon to* St. Bartholomew's Hoſpital. *p.* 397.

XXII. *A further Account of the* Libellæ *or* May-Flies, *from Mr.* John Bartram *of* Penſylvania; *communicated by Mr.* Peter Collinſon, *F. R. S. p.* 400.

I. *Remarks*

I. *Remarks upon an antient* Roman Inſcription, *found in that part of* Italy, *which formerly belonged to the* Sabines; *and now in the poſſeſſion of* Richard Rawlinſon, *LL. D. & F. R. S. By Mr.* John Ward, *Prof. Rhetor. Greſh. & F. R. S.*

Read Jan. 11. 1749-50.

THIS inſcription is cut in a ſmall braſs plate, which together with a draught of the ſame dimenſions accompany this paper. See TAB. I. *Fig.* 1. The words of the inſcription, as they ſtand on the plate, with ſome account how and where it was found, were formerly publiſh'd by *Fabretti*[a]. But as what he ſais is very ſhort, I ſhall take leave to tranſcribe the whole of it, which is as follows.

FLORAE
TI PLAVTIVS DROSVS
MAG II
V· S· L· M·

Minucius Felix[b], *Lactantiuſque*[c], Floram *inter propudioſa gentilitatis numina collocant. Vindicat autem hanc infamiam* Ouzelius *ad* Minucium, pag. 233, *ubi ex Varrone et Ennio probat Romulo anti-*

---

[a] *Inſcript. Antiq. Cap.* x. *pag.* 742.
[b] *Pag.* 28. *edit. Ouzel.* quarto.
[c] *Inſtit. Lib.* 1. *cap.* 20.

quiorem fuiſſe Florae *cultum, et flamines ei datos. Veſtigium igitur hic remanet in Sabinis primum* Floram *coli coeptam; cum e Sabino agro in lamella aenea inſcriptio haec nuper eruta fuerit apud* Licentiam, *Urſinorum oppidum, quod* Digentia *rivo alluitur.* Licentia *quippe a* Digentia *detortum nomen facile quis credet.*

The plate now before us, and the inſcription upon it, ſo exactly agree with this account of *Fabretti*, as to leave no doubt of their being the ſame with thoſe deſcribed by him. The preſent poſſeſſor of the plate purchaſed it at Rome, in January 1720. N. S. At which time a ſmall braſs label was fixed to it, containing the following words cut in capital letters, EX REGIIS CHRISTINÆ THESAVRIS; which is alſo here exhibited, with a draught of the ſame form and ſize ſubjoined to that of the inſcription. It is probable therefore, that this plate might have been depoſited among the other curioſities of that princeſs, ſoon after it was dug up; and afterwards have fallen into other hands, who affixed that label to it; till at length being expoſed to ſale, it was bought by the Doctor at the time above mentioned. For Queen *Chriſtina* died at Rome, April the 19, 1689, where ſhe had reſided from the year 1658, after her return thither from France [d]. The year following a catalogue of her Greek and Latin medals was printed at Rome [e], and *Fabretti* pu-

[d] *Moreri, Diction. Hiſtor.*

[e] *Nummi antiqui in theſauro Chriſtinae reginae Suecorum, Romae aſſervati, a Franciſco Camelo, ejuſdem Majeſtatis antiquario. Romae* 1690.

bliſhed

bliſhed his large and elaborate collection of *Antient inſcriptions* there in 1702. In which he ſais, that this plate, at the time he wrote his account of it, *nuper eruta fuerit.* But as he wrote this very probably ſome years before the publication of his book, the plate might have been found befote the death of that princeſs, and been in her poſſeſſion; and after her deceaſe come into ſuch hands, as might occaſion the diſpoſal of it, at the time, and in the manner, here recited.

But I ſhall now proceed to conſider the words of the inſcription; which may, I preſume, be read at length, with the proper ſupplements, in the following manner:

Florae Tiberius Plautius Droſus, pagi *magiſter* anni *ſecundi, votum ſolvit libens merito.*

The godeſs FLORA was thought by the *Romans* to preſide over feilds and trees, and therefore they addreſſed to her to favour them with proſperous and fruitful ſeaſons. Hence *Varro* ſais: *Invoco Rubigum et Floram, quibus propitiis, neque rubigo frumenta atque arbores corrumpit, neque non tempeſtive florent. Itaque publicae Robigo feriae Robigalia, Florae ludi Floralia ſunt inſtituti*[f]. But it appears from other paſſages of that writer refered to by *Fabretti,* that ſhe was firſt a Sabine deity, and introduced at Rome by king *Tatius* in the time of *Romulus,* many ages before the inſtitution of the

[f] *De R. R. Lib.* i. *cap.* 1.

Floralia. For that feſtival was not obſerved till the year of the city 513, when the expenſe of it was ordered to be paid out of the fines levied on thoſe perſons, who had converted the public lands to their own uſe, for feeding their cattle g. The memory of which is yet preſerved on a coin ſtruck that year, having on one ſide the *Genius of Rome*: and on the other a *ſheep*, as an emblem of the manner, by which that money was raiſed; with the legend M POBLICIVS MALEOLVS, the name of one of the aediles, who had the care of the coinage h. And the ſame year alſo he with his brother *Lucius Poblicius*, the other aedile, erected a temple in honour of the godeſs *Flora*, near to the great *circus* i. However the *Floralia* were not afterwards conſtantly obſerved, but only when the ſeaſon was bad, and ſeemed to threaten a ſcarcity of proviſions. But in the year 580 k, by a decree of the ſenate, they were ordered to be celebrated annually, upon the fourth of the kalends of May, and the three following days l, which ended with the firſt of that month.

TI, the two firſt letters of the *praenomen* of the perſon mentioned in the inſcription, are the uſual abbreviation of *Tiberius*; as a ſingle T is of *Titus* m.

---

g *Ovid. Faſt. Lib.* v. *v.* 279.
h See *Vaillant Fam. Rom. in* Poblicia, *num.* 1.
i *Tacit. Annal. Lib.* ii. *cap.* 49.
k See *Pighii Annales ad ann.* 513, 580.
l *Ovid. Faſt. Lib* v. *v.* 327, 183.
m *Valer. Prob. de not. Roman.*

PLAV-

PLAVTIVS, which follows, denotes the *family name*, and often occurs in Roman writers, as alſo upon coins, where it is ſometimes writen *Plotius*, and at other times *Plutius* [n].

DROSVS, the *cognomen*, I do not remember to have ſeen ſo ſpelt elſewhere; but I make no doubt of its being the ſame as *Druſus*, which we frequently meet with. For thus, as was juſt now obſerved, his family name is writen three ſeveral ways, *Plautius*, *Plotius*, and *Plutius*. And *Suetonius*, ſpeaking of the *Claudian* family, ſais: *Notiſſimum eſt Claudios omnes, excepto P. Clodio, optimates aſſertoreſque dignitatis ac potentiae patriciorum ſemper fuiſſe* [o]. So likewiſe *Poblicius*, the name of the aedile above mentioned, is ſometimes ſpelt *Publicius*. Theſe inſtances indeed all relate to the family name; but the ſame is true likewiſe with regard to the *cognomen*. So the name *Poblicola*, firſt given to *Publius Valerius*, the collegue of *Brutus*, but retained afterwards by the family, is generally writen *Publicola* [p]. And as to *Druſus*, *Suetonius* acquaints us with the original of that name. *Druſus*, ſais he, *hoſtium duce Drauſo cominus trucidato, ſibi poſteriſque ſuis cognomen invenit* [q]. His other uames were *Marcus Livius*, and the action here refered to was in the year of the city 470 [r].

---

[n] See *Vaillant Fam. Roman. in* Plautia.
[o] *In Tiber. cap.* 2.
[p] *Liv.* ii. 8. vii. 32.
[q] *In Tiber. cap.* 3.
[r] See *Pighii annales, ad an.* 470, 471.

It

It therefore seems very probable, that this *cognomen* being so antient, might by some of the descendents of that family be writen *Drosus*, and afterwards more generally *Drusus*. For as the Romans endeavoured gradually to improve their language, and soften its pronunciation, they changed *au* into *o*, and again *o* into *u*, for the more agreable sound. This appears not only from the examples given already, but likewise from many others, which might be be produced, as well of common words as proper names. Of the former sort are *codex* from *caudex*, *corus* from *caurus*, *lotus* from *lautus*, and *sorex* from *saurex*; and of the latter, *multus* from *moltus*, *rubigo* from *robigo*, *vulgus* from *volgus*, *Vulcanus* from *Volcanus*, and the like.

MAG. II. according to the explication given above, are an abbreviation of the words *magister secundi*, which stand for *pagi magister anni secundi*, was the whole to be expressed at length. The word *pagus* signifies a division or large portion of land, not much unlike what we call a *shire* or *county*. Hence *Caesar* in his history of the *Gallic war* sais: *Omnis civitas Helvetia in quatuor pagos divisa est* [s]. And again speaking of the *Suevi*, who were a very large nation: *Hi centum pagos habere dicuntur* [t]; tho' *pagus* is sometimes used by the poets in a more restrained sense, for a single *village*. So *Mandela* is described by *Horace*, as *rugosus frigore pagus* [v]. And *Virgil* represents the rural sports, as

[s] *Lib.* i. *cap.* 12.
[t] *Lib.* iv. *cap.* 1.
[v] *Epist. Lib.* i. xviii. 103.

performed

performed *pagos et compita circum* [x]. As to the title *magiſter*, it always denotes ſome preheminence and authority, and is uſed in a variety of ſenſes, as *maſter* is with us. So *Feſtus* ſais: *Magiſtri non ſolum doctores artium; ſed etiam pagorum, ſocietatum, vicorum, collegiorum, equitum dicuntur; quia omnes hi magis ceteris poſſunt* [y]. Of theſe the *magiſter pagi* was a very antient officer among the Romans, appointed by *Numa Pompilius*, the immediate ſucceſſor of *Romulus*, as we learn from *Dionyſius* of *Halicarnaſſus*. "For *Numa* (as he "ſais) firſt divided the whole country into ſuch "portions, as they call πάγες; over each of which "he appointed an officer, whom he calls ἄρχοντα, "ἐπίσκοπον, and περίπολον, that is, a preſident or "*maſter*, inſpector, and ſurveyor. His buſineſs was "to ſurvey the lands, and take an account in wri-"ting, whether they were well or ill cultivated; "which accounts he laid before the king: who "commended thoſe husbandmen, who had been "diligent, and treated them courteouſly; but re-"proved and fined the indolent, in order to excite "them to greater diligence [z]." The Roman territories at that time were confined within very narrow bounds; but in after ages, as they inlarged their dominions by conqueſts, many of the countries, which they ſubdued, were given to the ſoldiers, as a reward for their ſervice. And as a certain quantity of land was alloted to each ſoldier, the diſtribution was made by perſons ſent with them for that purpoſe; and thoſe ſettlements, or colo-

[x] *Georg. Lib.* ii. 382.

[y] *In voc.* Magiſterare.

[z] *Antiq. Rom. Lib.* ii. *cap.* 76.

nies,

nies, were divided into ſeveral diſtricts, or *pagi*, which were conſidered as diſtinct communities. And becauſe differences would ſometimes happen among them afterwards about the limits of their poſſeſſions, the *magiſtri pagorum* were impowered to adjuſt them, and prevent all incroachments of that ſort. For which end alſo public proceſſions were made at certain times, accompanied with ſacrifices and other religious ceremonies [a], in honour of the tutelar deity of the place, the expenſe of which was born by contributions of the inhabitants; as was ſhewn in a former paper, which I had the honour to lay before this Society [b]. Theſe officers had likewiſe the care of the roads, which led from one town or village to another, within their reſpective juriſdictions, to keep them in good repair [c]. And another part of their duty was to provide accommodations for the armies in their march, as alſo for the governors of provinces, and other great perſons, in paſſing thro their ſeveral diſtricts upon public affairs [d]. Horace ſeems to refer to this, when he ſais:

Huc venturus erat Maecenas, optimus atque
Cocceius, miſſi magnis de rebus uterque
Legati; averſos ſoliti componere amicos.

And ſoon after:

Proxima Campano ponti quæ villula tectum
Praebuit; et parochi, quae debent, ligna ſalemque [e].

---

[a] *Siculus Flaccus, pag.* 9, 25, edit. Goeſ.
[b] See *Philoſ. Tranſact. num.* 486.
[c] *Sicul. Flacc. ubi ſupra. Frag. Magon. et Veg. pag.* 255.
[d] *Sic. Flac. pag.* 25.
[e] *Serm. Lib.* i. *Eclog.* v. *v.* 27, 45.

Where

Where by *parochi* (ſo named from παρέχειν to *provide*) may be meant an inferior ſort of *officers*, appointed by the *maſter* to provide all neceſſaries for ſtrangers, included here in the words *ligna ſalemque* [f].

But as the title *magiſter* was common to ſo many officers of different characters, it may be expected, that ſome reaſon ſhould be alleged for aſſigning it to the *magiſter pagi* in this inſcription, where no other word is added to determine the particular ſenſe of it. And indeed I cannot pretend to offer any direct proof for this; but the reaſons, which induce me to think ſo, are theſe which follow. Both the deſign and form of the inſcription ſeem to ſuit him beſt. For the purport of it being the performance of a vow to the godeſs *Flora*, very probably for a proſperous and fruitful ſeaſon, as the effect of their addreſſes to her; by whom could that ſo properly be done, as by this officer, who preſided over the religious as well as civil affairs of the inhabitants? Beſides, I cannot but think from the name *Droſus*, which elſewhere is always ſpelt *Druſus*, that this inſcription was writen before ſeveral other officers were appointed, who afterwards bore the title of *magiſter*; which might render any explanatory word unneceſſary at that time, eſpecially in the place where he had his reſidence. There are indeed two inſcriptions publiſhed, one by *Gruter* [g], and the other by *Rineſius* [h],

---

[f] See *Budaei Annot. in Pandect. p.* 262.
[g] *Pag.* XXVI. *num.* 9.
[h] *Claſſ. ſext. num.* LXXII.

in which the word PAGI is added to MAGISTER; in the ſame manner as we meet with *magiſter collegii, vici*, and the like. But the former of theſe was as late as the reign of *Tiberius*; and the time of the latter uncertain, ſo that nothing can be concluded from it. And there are likewiſe ſeveral inſcriptions, in which MAGISTER and MAGISTRI ſtand alone, without the addition of any explanatory word. But then it appears either from the deſign of thoſe inſcriptions, the number of perſons mentioned, or ſome other circumſtance relating to them, that their office was of a different nature; ſome few inſtances of which I ſhall preſently have occaſion to mention. From theſe conſiderations therefore I have been led to conclude, that the ſenſe here aſſigned to the word *magiſter*, as it reſpects this inſcription, is the moſt probable.

That the characters $\overline{\text{II}}$. ſtand for *anni ſecundi*, the date of the time, during which this *Droſus* had then held that office, is confirmed by ſeveral inſcriptions publiſhed by *Gruter*. In one of which we have MAG. ANNI. $\overline{\text{V}}$ [i]; in another MAGISTRI. ANNI. $\overline{\text{VI}}$ [k]; and in two others MAG. ANNI. PRIMI [l], where the word denoting the time is expreſſed at length. As theſe different ways therefore of expreſſing the time relate to perſons, who all bore that title, tho not the ſame office,

---

[i] *Pag.* LIV. *num.* 1.
[k] *Pag.* XXXVI. *num.* 7.
[l] *Pag.* XXXIII. *num.* 10. XXXV. 5.

as

as appears by the inſcriptions; they plainly ſhew in what ſenſe thoſe characters are to be taken here.

The concluding letters V. S. L. M. which ſtand for *votum ſolvit libens merito*, contain the uſual form of dedicating votive monuments.

But the thing dedicated is not mentioned here, which was moſt probably a ſtatue or an altar; and I rather think the latter, from the number of ſuch inſcriptions in *Gruter*, and other collectors of antient monuments, taken from altars. Whereas we hear of few images of any ſort relating to this deity. *Pliny* indeed mentions a ſtatue of *Flora* at *Rome*, which was made by *Praxiteles* [m]. And *Montfaucon* has given the draughts of three or four others, which have been thought to repreſent that godeſs [n]. Her head alſo is found upon two coins, one of the *Claudian* [o], and the other of the *Servilian* family [p]. However theſe are but very few, comparatively with what we meet with of other deities. Beſides, the age of this inſcription (which ſeems further confirmed by its brevity and ſimplicity) as likewiſe the place where it was diſcovered, ſuit much better with an altar; for altars were erected in all parts of the country, and very early. I ſuppoſe therefore, that this plate was fixed into the front of ſome altar conſecrated to *Flora*; for which purpoſe both

[m] *Nat. Hiſt. Lib.* xxxvi. *cap.* v. §. 5.
[n] *L. Antiq. expliq. Tom.* i. *par.* 2. *chap.* 30.
[o] See *Vaillant Fam. Rom. num.* 13.
[p] *Ibid. num.* 17.

the ſhape of it, and the angles at each end, ſeem to be very well adapted. The town, where it was dug up, is by *Fabretti* called *Licentia*; which he ſuppoſes to have taken its name from the river *Digentia*, that runs by it. *Horace*'s farm therefore was probably not very far from thence, ſince he ſpeaks of it as near that river, when he ſais:

Me quotiens reficit gelidus Digentia rivus;
Quem Mandela bibit, rugoſus frigore pagus:
Quid ſentire putas, quid credis, amice, precari [q]*?*

The antiquity of this inſcription, together with its ſingularity, made me think it not unworthy the notice of this learned Society. For tho we meet with two inſcriptions, one in *Gruter*, [r] and the other in *Rineſius* [s], to the honour of *Flora* jointly with other deities; yet this is the only one I can find, which is addreſſed to her alone. And as to the manner of explaining the ſeveral parts of it, that is left to every one to judge of, as he pleaſes.

G. C.
Decemb. 20, 1749.

JOHN WARD.

---

[q] *Epiſt. Lib.* i. XVIII. 103.
[r] *Pag.* CXXI. *num.* I.
[s] *Claſſ. prim. num.* CCXXXIII.

II. *Epi-*

II. *Epiſtola a Rev. Patre P.* Auguſtino Hallerſtein, *S. J. M.* Collegii Aſtronomici Pekinenſis *Præſide, ad* Cromwell Mortimer, *M. D. Secret. R. S. miſſa, una cum Obſervationibus* Cometæ *viſi Pekini* 1748. Novæ *Conſtellationis Occultationis* Martis *et* Lunæ *Dec.* 6. 1747. *Conjunctionis* Martis & Veneris *menſe Martio* 1748. & *Congreſſus* Jovis & Veneris *Jan.* 1. 1748. *ibidem quoque factis.*

Clariſſimo Viro Domino CROMWELLO MORTIMER

S. P. D.

Collegii Pekinenſis PATRES Societatis Jeſu.

Read January 18. 1749. HUmaniſſimas tuas, vir clariſſime, quas Nonis Februarii 1746 ad nos dediſti Collegii Pekinenſis Socios, ſub initium Novembris hujus anni 1748. cum magna voluptate accepimus. Neque enim non poteramus nobis maximopere gratulari honorem, quo nos clariſſima Societas veſtra dignata eſt, obſervationes noſtras aſtronomicas qualeſcunque æqui bonique conſulendo, atque etiam continuationem commercii literarii a nobis efflagitando.

Fuerunt illæ Obſervationes factæ a deceſſoribus hic noſtris PP. Ignatio Kögler, et Andrea Pereyra, qui cum

cum ambo ad meliorem vitam abierunt, ſucceſſimus illis Ego, et P. Antonius Gogeiſt, qui non deerimus pro modulo noſtro æquiſſimæ poſtulationi veſtræ reſpondere. Et quas quidem impræſentiarum promptas habebamus obſervatiunculas noſtras hujus anni, ante dies bene multos tradidi Patri Antonio Gaubil eaſdem a me efflagitanti, ut eas ad ſuos in Galliam tranſmittere poſſet; acceptis autem humaniſſimis tuis, vir clariſſime, cum eas nondum expediviſſet, expoſcenti mihi recepit ſe eas recta ad te miſſurum una cum hac Epiſtola noſtra.

Vobis certe, Viri clariſſimi, atque inclytæ Societati veſtræ, plurimum obſtricta eſt Aſtronomia hic noſtra, ut quibus maximo adjumento ſunt, doctiſſimæ lucubrationes clariſſimorum virorum veſtralium Newtoni, Gregorii, Flamſtedii, aliorumque. Juſtum igitur et æquum nobis viſum tibi, vir clariſſime, tuorumque deſideriis morem gerere, dum vos, viri clariſſimi, pergatis nos lucubrationibus veſtris erudire, et favoribus proſequi.

Atque cum impræſentiarum nobis pluribus non liceat, prolixiores anno venturo daturos nos pollicemur. Valete.

Dabam Pekini, in Collegio Societ. Jeſu.
VI. Iduum Novembris 1748.

AUGUSTINUS HALLERSTEIN, S.J.M.
Collegii Aſtronomici Præſes.

Via, & Ephemeris Cometæ viſi Pekini Sinarum, 1748.

VIſus nobis iſthic hoc anno Cometa, ſane quam triſtis et infelix, præterquam enim quod lumine luceret admodum obſcuro et maligno, via inceſſit tam deſerta, [*vid.* TAB. I. *Fig.* 2.] cœlo tam parum favente, ut non niſi raro, cum paucis aliquot ſtellulis, nec iſtis ſcio, quam ſuo loco poſitis comparari potuerit.

Die 26 April. mane ſub horam tertiam primum viſus eſt illis, qui ex officio in ſpecula aſtronomica hujus regiæ excubant; notaturque illius locus armilla zodiacali rudiuſcule ſcilicet in 18° ♓ cum Lat. bor. 27° nempe in pectore Pegaſi ſub ſtellis λ et μ, caput æqualis ſtellæ tertii ordinis, cauda longa quaſi uno gradu.

Sequentibus diebus nulla diligentia obtineri potuit, ut cum aliqua fixa accuratius compararetur; itaque craſſiuſcule ſolum determinata illius aliqua loca per configurationes cum circumvicinis ſtellis, quæ ut calculi rigorem non ferant, viam ſaltem quam Cometa teneret, indigitarent; nimirum,

Die 27 Aprilis mane circa 2ʰ Long. ♓ 21° 20′ cum Lat. bor. 31° 35′.

Die 28 Aprilis man. ſub idem tempus ♓ 25° 15′ cum Lat. bor. 36° 0′.

Die 29 Aprilis man. ſub idem tempus ♓ 29° 10 cum Lat. bor. 40° 0′.

Die 30 April. & 1 Maii, per nubes nihil viſum.

Die 2 Maii mane comparari demum potuit Cometa cum ſtellula lucidiuſcula media inter 5 ſtellulas, quæ ſunt in flexu catenæ Andromedæ, notaturque

que ope micrometri & penduli 2^h 31′ 49″ t. v. Cometa orientalior ſtella 1′ 50″ penduli, eademque borealior 57′ 8″.

Die 6 Maii mane comparatus Cometa cum ſtellula quæ in Cat. Britannico Flamſt. ponitur in conſtellatione Caſſiopeæ ordine ſexta, per differentias declinationum et diſtantias, eo quod ob cœlum non ſatis ſudum, tardum motum, et malignum lumen Cometæ tranſitus ejuſdem per horarium etiam inter plura ſecunda penduli definiri non poſſet; nimirum 2^h 3′ 57″ t. v. erat Cometa borealior ſtella 44′ 8″, captaque illico diſtantia erat 50′ 50″.

Sequentibus diebus comparatus Cometa cum variis ſtellulis, ſed ignotis; unde nihil de illius loco ſtatui potuit.

Die 15 Maii veſpere circa nonam (momentum enim temporis per oblivionem notatum non eſt) viſus Cometa inter duas ſtellulas, a quarum propiore diſtabat in auſtrum (ſitu recto, non inverſo) 11′ 3″ et a remotiore in boream 59′ 58″. Videbatur etiam Cometa orientalior propiore 1′ penduli. Hæ duæ ſtellulæ ponuntur in Cat. Brit. Flamſt. in conſtellatione Caſſiopeæ ſub finem borealior quidem, eaque propior in ♊ 4°. 49′ 7″ cum lat. bor. 58° 6′ 56″, auſtralior autem eademque remotior in ♊ 3° 28′ 12″ cum lat. bor. 57° 11′ 10″, nempe ad annum illum 1690.

Die 16 Maii comparatus Cometa cum heſternarum borealiore, 11^h 1′ 59″ noctis erat orientalior ſtella 18′ 26″ penduli, eaque borealior 26′ 4″.

Die 19 Maii comparatus Cometa cum ſtella quæ in Catalogo fixarum J. Hevelii illo ad annum 1700 ponitur ſextæ magnitudinis in Cepheo, vocaturque

ſub

ſub faſcia ſequens, eratque 10^h 23′ 29″ noctis Cometa in eadem aſcenſione recta cum ſtella : certe nunquam notari aliqua potuit temporis differentia inter utriuſque tranſitum pro horarium ; erat autem Cometa borealior ſtella 48′ 14″.

Inde viſus per ſequentes dies nihil certi de loco Cometæ conſtitutum.

Die 29 Maii viſus Cometa juxta complures ſtellulas, ſed ignotas, ſcilicet moto paulum tubo apparuit, nempe quam Hevelius in Catalogo ſuo fixarum illo ad annum 1660 ponit in conſtellatione Camelopardali, vocatque *Supra tergum, ſive in cuſpide pedis ſiniſtri Cephei* 5æ magnit. Cum autem hujus ſtellæ parallelus longius diſtaret a parallelo Cometæ, quam ut immediate cum illa comparari poſſet, comparatus eſt mediante ſtellula intermedia, notaturque Cometa 11^h 21′ 25″ noctis orientalior dicta ſtella 16′ 13″ penduli, eademque auſtralior 1° 37′ 22″.

Inde quia juxta viam Cometæ nullæ erant, neque futuræ videbantur ſtellæ cum quibus comparari poſſet, longius eæ ſcilicet petendæ erant : itaque ſequentibus diebus comparatus eſt cum γ Cephei, a cujus parallelo non multum aberat. Ergo teleſcopio probe firmato,

Die 1 Jun. veſp. 9^h 30′ 53″ γ Cephei ad horarium.
2 Jun. mane 3^h 24′ 51″ Cometa ad horarium borealior ſtella 26′ 59″
Die 4 Jun. veſp. 8^h 28′ 58″ γ Cephei ad horar.
5 Jun. mane 2^h 41′ 9″ Cometa ad hor. auſtralior ſtella γ 8′ 20″.
Die 5 Jun. veſp. 8^h 23′ 23″ γ Cephei ad horar.
6 Jun. mane 2^h 41′ 17″ Cometa ad horar. auſtralior ſtella 20′ 12″.

Die 7 Jun. veſp. $8^h\ 5'\ 3''$ γ Cephei ad horar.
8 Jun. mane $2^h\ 32'\ 51''$ Cometa ad horar. auſtralior ſtella $42'\ 51''$.
Die 8 Jun. veſp. $8^h\ 31'\ 59''$ γ Cephei ad horar.
9 Jun. mane $3^h\ 4'\ 38''$ Cometa ad horar. auſtralior ſtella $55'\ 34''$.

Die 12 Jun. veſp. cum jam vix ſpes eſſet videndi ultra cometæ, vidi illum tamen parvum jam obſcurum, veſtigium aliquod cometæ verius quam cometam. Adde clarorem Lunæ et nubiluginem ab eadem colluſtratam, quæ omnia difficilem, dubiam, et parum tutam faciunt obſervationem, præſertim accidente etiam lumine laternæ; nihilominus, ut potui, comparavi eundem cum ſtellula, quam poſtea reperi in una Mappula et Catalogo Dni. de la Caille in tomo Memor. Acad. Reg. Scient. Pariſ. 1742 anni occaſione cometæ illius anni detectam, et notatam cum aſcenſione recta ad id tempus $91°\ 21'$ et decl. bor. $73°\ 49'$, ſignatamque litera *A*, itaque $9^h\ 33'\ 6''$ *A* ad horar. tum $9^h\ 45'\ 23''$ Cometa ad hor. borealior ſtella $46'\ 34''$.

Die 13 Jun. veſp. $9^h\ 13'\ 11''$ *A* ad horarium $9^h\ 29'\ 43$ Cometa ad horarium borealior ſtella $36'\ 15''$.

Die 14 Jun. veſp. $9^h\ 15'\ 44''$ *A* ad horarium $9^h\ 36'\ 4'$ Cometa ad hor. borealior ſtella $25'\ 47''$. Tum viſa $9^h\ 55'$ dimenſæ diſtantiæ Cometæ a ſtellis

I	$25'$	$9''$
B	38	39
R	43	3

Stabat autem Cometa juxta ſtellam $\mathcal{Q}$ quæ ſtellæ omnes loco citato notatæ ſunt.

Die 15 et 16 Junii per nubes obſervare nihil licuit.

Die

Die 17 et 18 me domo abeunte obſervavit P. Ant. Gaubil ſic.

Die 17 Jun. veſp. 9^h 26′ 30″ *A* ad horarium.
53 35 *R* ad horarium.
9^h 55′ 15″ Cometa ad hor. in eod. parallelo cum *A*.

Die 18 Jun. veſp. 9^h 52′ 14″ *A* ad horarium.
10 19 21 *K* ad horarium.
9^h 24′ 50″ Cometa ad hor. auſtraliór ſtella *A* 16′ 30″.
ſtella *R* 10 20

Eſt autem ſtellæ *R* aſc. recta 98° $6\frac{1}{2}'$ et decl. bor. 73° 43′.

Tempora obſervationum omnia ſunt vera, et ſatis correcta.

Obſervationes porro factæ ſunt tubo 6 pedum, cui inſertum Micrometum Anglicum.

Nova Conſtellatio.

Ut ne pars hæc folii vacua abiret, addam conſtellatiunculam quæ 29 Maii cometam tubo venanti occurrit; ea eſt, qualis in TAB. I. *Fig.* 3. apparet, quarum ſtellularum, diſtantia erant α a β 12′ 19″, β a γ 16′ 45″, γ a δ 10′ 2″, δ ab ε 16′ 45″, γ a ζ 19′ 53″, δ ab ζ 28′ 17″, γ a θ, quæ eſt ipſa Camelopardali *ſupra tergum* 58′ 16″; δ ab eadem 50′ 3″. Sed has ipſas diſtantias aliis accuratius dimetiendas relinquo. Eſt autem ſitus hujus aſteriſmi rectus, non inverſus.

Occultatio Martis *a* Luna *observata Pekini Sinarum* 1747. *mense Decembris die sexta vesp.*

h	′	″	
4	52	17	♂ distabat a limbo lucido Lunæ 50′ 4″.
			Tum ♂ observatus, et comparatus cum stella 1. ♍ sic :
5	3	9	♂ ad horarium.
	12	47	1. ad horarium borealior quam ♂ 41′ 6″
	9	38	Differentia temporaria.
5	18	26	♂ ad horarium.
	28	2	1. ad horarium borealior quam ♂ 41′ 2″
	9	36	Differentia temporaria.
5	34	34	♂ ingressus sub limbum obscurum ☾ totus disparuit, distans a cornu boreo ☾ 23′ 28″
			Illico dimensa diameter ☾ erat 32′ 53″
			Pars autem lucida ☾ erat 7′ 39″
			Interea dum ♂ post ☾ lateret, observata et comparata ☾ cum stella θ ♍ sic :
5	58	9	θ ad horarium.
6	3	31	Limbus lucidus ☾ ad horarium.
	4	23	Cornu boreum ☾ ad horarium.
		58	Cornu australe ☾ ad horarium.
			Eratque limbus australis ☾ australior stella θ 34′ 27″
			Iterum
6	11	36	θ ad horarium.
	17	22	Limbus lucidus ☾ ad horarium.
	18	12	Cornu boreum ☾ ad horarium.
		46	Cornu australe ☾ ad horarium.
			Erat autem limbus australis ☾ australior stella θ 31′ 0″.

Tertio

h ′ ″ Tertio

6 23 22 θ ad horarium.

29 26 Limbus lucidus ☾ ad horarium.

30 17 Cornu boreum ☾ ad horarium.

52 Cornu auſtrinum ☾ ad horarium.

Erat autem limbus auſtrinus ☾ auſtralior ſtella θ 27′ 48″.

6 38 52 Erat quædam parvula ſtellula appropinquans limbo obſcuro ☾, cumque ſubingreſſura diſtabat a limbo lucido ☾ 41′ 23″. Tum

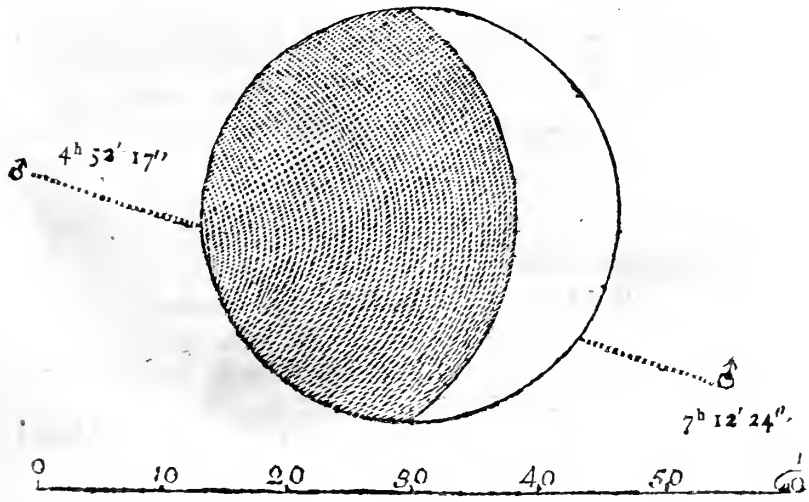
6 46 2 ♂ primo apparuit prodiens de ſub ☾, diſtanſque a cornu boreo ☾ 29′ 24″.

7 2 23 Supradicta parva ſtellula ſubingreſſa limbum obſcurum ☾ diſtans a cornu boreo ☾ totidem 29′ 24″. Denique

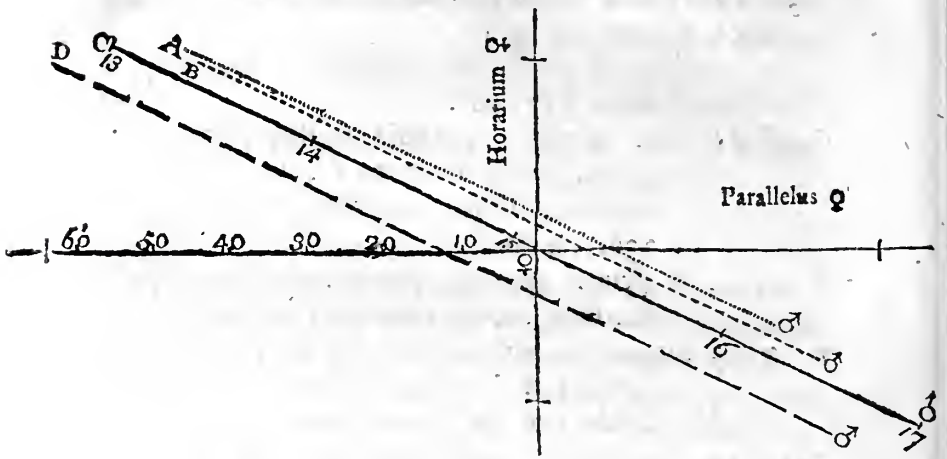
7 12 24 Diſtabat ♂ a limbo lucido ☾ 11′ 30″.

Temporum momenta ſunt vera, et correcta per altitudines correſpondentes.

Phaſes omnes obſervatæ tubo ſex pedum, cui inſertum micrometrum Anglicum.



Conjunctio Martis *et* Veneris, *observata* Pekini *Sinarum mense Martio Anno* 1748.



A ♂, est via ♂ juxta ☿ ex Ephemeridibus Pekinensibus.
B ♂, eadem via ex Ephemeridibus Parisiensibus De la Caille.
C ♂, eadem via ex Observationibus.
D ♂, eadem via ex Ephemeridibus Bononiensibus D. Manfredi.

Observationes porro sic habent:

	h	′	″		°	′	″
Martii die 12.	6	27	52	♂ orientalior ☿	1	48	48
eaque borealior		53	46.				
Martii die 13.	6	25	43	♂ orientalior ☿	0	56	8
eaque borealior		27	26.				
Martii die 14.	6	10	33	♂ orientalior ☿	0	29	34
eaque borealior		14	36.				

Martii

	♄	′	″			°	′	″
Martii die 15.	6	28	4	♂ orientalior	♀	0	3	0
eaque borealior		1	30.					
Martii die 16.	6	27	13	♂ occidentalior	♀	0	23	48
eaque auſtralior		10	41.					
Martii die 17.	6	25	14	♂ occidentalior	♀	0	50	38
eaque auſtralior		23	24.					
Martii die 19.	6	29	52	♂ occidentalior	♀	1	44	47
eaque auſtralior		48	14.					

Omnes hæ differentiæ determinatæ ſunt ex repetitis operationibus, tubo 6 pedum cum micrometris.
Tempora item vera, et correcta per altitudines correſpondentes.

Ut folium hoc impleatur, addenda viſa

Obſervatio congreſſus Jovis *cum* Venere, *Anno* 1748, 1 Januarii veſpere.

	5ʰ	15′	41″	diſtabat ♃ a ♀ 1° 3′ 49″. Tum
	5	22	14	♃ ad horarium.
		25	6	♀ ad horar. auſtralior ♃e 50′ 35″
		2	52	
Iterum	5	26	36	♃ ad horarium.
		29	32	♀ ad horar. auſtralior ♃e 50′ 15″
		2	56	
Tertio	5	30	35	♃ ad horarium.
		33	34	♀ ad horar. auſtralior ♃e 49′ 37″
		2	59	

III. *Obſervatio Cometæ, Anno* 1748, *cum aliis aliquot Obſervationibus aſtronomicis a Rev. P. P.* Antonio Gaubil *e Soc. Jeſu ad eundem tranſmiſſa; in Reſidentia* PP. Gallor. *Soc. Jeſu* Pekini.

DIE 27 April. mane 3^h 30′ vidimus cometam in medio ſtellarum Pegaſi $\beta \lambda \eta$.

2 Maii comparavimus etiam cometam cum ſtellis de quibus agit P. Hallerſtein in Flamſtedio 1690. Stella in Υ 11° 26′ 45″. Locus cometæ idem ferme concluditur ſeu ex noſtra ſeu P. Hallerſtein obſervatione.

3 Maii 3^h mane α et σ Caſſiopeæ in linea recta cum cometa. σ eſt in medio ſat præcisè.

4 Maii mane $4^h \frac{1}{4}$ cometa occidentalior 3^a ſtella in Caſſiop. apud Flamſtedium 5′ 35″, cometa auſtralior 1° 1′.

5 Maii nihil exacte obſervari potuit.

6 Maii mane 2^h 51′ linea per α et β Caſſiopeæ paululum ad auſtrum cometæ, diſtantia β a ſtella $\varkappa$ = diſtantiæ β a cometa.

10 Maii veſpere, 9^h 14′ minima altit. cometæ vera 20° 48′ 58″ cometa occidentalior orientali ſtella (componitur ex duabus) 27′ 12″; in Flamſtedio ſtella in Tauro 25° et aliquot min.

15 Maii comparavimus etiam cometam cum ſtellis P. Hallerſtein. Cometæ altit. merid. vera p. m. 25° 51′ 30″ 10^h 12′. Cometa auſtralior ſtella 8′; altid. mer. ſtellæ boreal. 25° 59′ 30″. Non bene obſervavimus differentiam aſc. rectæ.

16 Maii

16 Mai. p. m. vera altit. merid. cometæ 26° 16′ 32″; in reticulo 10ʰ 22′: cometa orientalior ſtella P. Hallerſtein 1° 41′.

17 Maii p. m. 10ʰ 40′ vera altid. minima cometæ 26° 46′ 34″.

♈ Cephæi ad horarium 7ʰ 54′ 58″.

Cometa ad horar. 10ʰ 41′ 43″.

Via cometæ videtur borealior via ſtellæ 38′ 20″.

In ſchedulis non reperio ſat multas obſervationes factas uſque ad 7 Jun. Sed ex comparatione cometæ cum Heveliana ſtella, de qua infra, et aliis non ita bene cognitis mihi, videor poſſe concludere, a die 2ᵈᵒ Jun. ad 7mum cometæ aſc. rectam creviſſe 6 grad. et minut. aliquot. declin. vero decreviſſe 55′.

7 Jun. mane 1ʰ 15′ ſtella ad horarium 35′ 30″ poſt cometam. Stella borealior 1° 30′ ſat. dubie obſer. *

9 Jun. 0ʰ 45′ cometa ad horarium.

0ʰ 49′ 10″ ſtella ad horarium *A*. §

Cometa berealior 1° 30′.

Uſque ad 12 Jun. nihil ſat exacti fuit obſervatum.

13 Jun. p. m. 9ʰ 30′ diſtantia cometæ a ſtella *I* ‖ 10′ 20″.

Cometa borealior 4′ 25″.

Cometa eſt orientalior.

17 Jun. p. m. 0ʰ 26′ 30″ *A* ad horar. } †

53 35 *R* ad horar. }

55 15 cometa ad hor.

Cometa et R in eadem declin.

---

* Hevelii ſtella ad ann. 1660. aſc. recta 2° 24′ 39″. Diſt. a polo 12° 42′ 17″.

§ Stella *A* in Fig. *D* de la Caille in Act. Pariſ. 1740.

‖ Stella *I* in Fig. *D* de la Caille. Act. Pariſ. 1742.

† *A. R.* ſtellarum notæ in Fig. *D* de la Caille, Act. Acad. Pariſ. 1742.

18 Jun. p. m. 9^h 52′ 14″ *A* ad horar.
10 19 21 *R* ad horar.
24 57 cometa ad horar.

Cometa auſtralior *A* 16′ 30″
auſtralior *R* 10 20.

Diebus ſequentibus tubo 7 ped. et amplius, cujus apertura = 1° 0′ 24″, obſervatus eſt cometa cum ſtella $\mathcal{D}$ in Fig. *B. La Caille* Act. Acad. Pariſ. 1742. Nullum fere ſucceſſum habuere multæ ex illis obſervationibus: refero tantum duas, quæ non mihi videntur omnino exactæ.

27 Jun. p. m. ſtella $\mathcal{D}$ intrat in tubum 9^h 23′ 10″
exit ex tubo 9 36 0
cometa intrat 9 40 28
exit 9 52 16

Cometa concluditur borealior 19′ 40″.

29 Jun. $\mathcal{D}$ intrat 11^h 1′ 40″ p. m.
exit 11 14 51
Cometa intrat 11 23 54
exit 11 36 0

Cometa concludit borealior 12′ aut forte 13′.

Non facile videbatur cometa 29 Jun. fuere nubes diebus 30 Jun. 1 et 2 Julii; nec deinde quæſitus eſt cometa.

En, domine illuſtriſſime, obſervationes aliquot cometæ.

Pekini, 8 Nov. 1748.

Ant. Gaubil, S. J.

Obſ.

Obſ. conjunctionis Martis *cum* Venere.

1748. t. v. 15 Mart. p. m. 8^h 10′ limbus occident. ♂ diſtat a limbo occidentali ♀ 1′ 29″.

Obſ. aliquot Eclipſ. Satell. Jovis.

13 Octob. p. m. tempore vero 9^h 40′ 30″ ima Em. 3^i ſatell. ♃. tub. 15 ped.

15 Octob. p. m. tempore vero 8^h 37′ 26″ Emerſ. 1^i ſatell. eod. tubo.

20 Octob. p. m. tempore vero 10^h 7′ 56″ Imm. total. 3^i ſatell. eod. tub.

21 Octob. p. m. tempore vero 5^h 52′ 12″ Emerſ. 2^{di} ſatell. eod. tub. dubiè.

28 Octob. p. m. tempore vero 8^h 29′ 20″ ima Em. 2^{di} ſatell. eod. tubo.

7 Nov. p. m. tempore vero 8^h 52′ 59″ ima Emerſ. 1^i ſatell. eod. tubo.

IV. *An Account of an* Aurora Auſtralis, *ſeen* Jan. 23. 1749-50, *at* Chelſea, *by* John Martyn, *F. R. S.* Prof. Bot. Cantab. *communicated by* Martin Folkes, *Eſq*; Præſ. Reg. Soc.

Read Jan. 25. 1749-50.

JAN. 23. $17\frac{49}{50}$ at about half an Hour after five in the Evening, caſting my Eye accidentally toward a Window which looked to the S. S. W. I thought I ſaw a reddiſh Light about the Planet *Venus*, which then ſhone exceedingly bright. Being ſuſpicious of ſome Fire in the Neighbourhood, I went immediately to a Window on the

Stair-caſe, where I ſaw a reddiſh Light, which ſhone with ſuch exceeding Brightneſs, that the Luſtre of the fine Conſtellation of *Orion* was almoſt effaced. I then went to a Window facing the N. N. E. where I preſently ſaw a very broad Band of Crimſon Light, like that which I obſerved from the ſame Window, *March* 18. 1738-9; an Account of which is printed in the *Phil. Tranſ.* No 461. But in the former the red Band was bounded on the N. by Streams of a greeniſh Blue; whereas the Band now obſerved was entirely of a deep Crimſon Colour, being of a much darker Red than the former.

Thence I withdrew into my Garden, where I plainly ſaw a Band or Arch, of a very deep Crimſon Colour, in Appearance about 15° broad, the Southern Edge of which paſſed juſt above *Canis minor*, and the Shoulders of *Orion*. It was terminated to the Weſtward, near *Venus*, then about 20° high: but it extended to the Eaſtward as far as I could ſee, and the farther it went that way, the deeper was the Colour, and the broader the Band. About a Quarter before Eight, there was formed a Crown about 30 Degrees to the Southward of the Zenith; for I could plainly perceive the *Pleiades*, which had then juſt paſſed the Meridian, very near it, when the Light was faint. From this Crown a great many Rays darted to the E. S. and W. but not toward the N. where only ſome whitiſh Streaks were to be ſeen, but very faint. Preſently after this, the Part of the Arch extending to the Eaſt ſeemed to be ſuddenly kindled, as if ſome Train had been fired; grew extremely bright and vivid; and as if all the

the red Matter had been then conſumed, put an End to the Phænomenon before Eight.

During the reſt of the Evening, a pale Light covered the South Part of the Heavens, as if the Moon had ſhone.

V. *A Letter from Mr.* Chriſtopher Maire *to the Preſident, containing* Obſervations *made at* Rome *of the* Eclipſe *of the* Moon, Dec. 23. 1749; *and of that of the* Sun, Jan. 8. 1750.

Honour'd Sir,

Read Febr. 1. 1749. I Herewith ſend you my Obſervation of the two late Eclipſes, to be communicated, if you pleaſe, to the Royal Society. The 23d of *December*, on which happened that of the Moon, was ſo boiſterous a Day, that I deſpair'd of being able to ſee it, and for that Reaſon neglected to put my Micrometer in Order. My Clock had likewiſe been altered without my Knowlege, on which Account I betook myſelf too late to the Obſervation, as will appear by the following Detail. The Place of both Obſervations is in the Latitude of 41° 54′ 0″. four Seconds of Time Eaſtward of *St. Peter's*. For I take it

it for granted that the *Thermæ Diocleſianæ* are, according to *Bianchini*'s Determination, in the Latitude of 41° 54′ 27″.

Eclipſe of the Moon, *Dec.* 23. 1749.

Chord of the Part eclipſed 13 Min. as was deduc'd from the Map of the Moon -	7h	47′	18″
Hence Beginning of the Eclipſe -	7	40	53
The Shade to *Tycho* and *Capuanus* -	7	54	3
Tycho intirely covered - - -	7	55	56
Shade to *Fracaſtorius* - - -	8	28	43
Fracaſtorius quite hid - -	8	30	24
Tycho intirely diſengaged - -	9	30	24
End of the Eclipſe, as far as could be perceiv'd thro' a thin Cloud - -	10	0	16

I judg'd the Eclipſe to be ſomewhat leſs than five Digits.

Solar Eclipſe, *Jan.* 8. 1750.

Beginning by a Reflector of Mr. *Short*, *Jan.* 7. - - - - -	20h	34′	35″
The firſt Spot covered - - -	20	49	50
The reſt could not be obſerved for the Clouds - - - -			
Quantity of the Eclipſe 7 Dig. 48. Min.	21	49	4
Again more exactly - 7 - 43 -	21	51	28
The Sun appears for a Moment; Horns nearly horizontal - - -	21	56	15

Two Digits remain eclipſed - -	$22^h\ 55'\ 37''$
One Digit exactly - - - -	23 3 42
End of the Eclipſe - - - -	23 11 32

The Obſervation was made with a 7 Foot Tube, 2610 Parts of the Micrometer juſt claſping the Sun's Diameter.

I am, with all poſſible Reſpect,

Honoured Sir,

Rome, Jan. 14. 1750.

Your moſt Obedient
Humble Servant
CHRISTOPHER MAIRE.

VI. *Some Obſervations on the* Dragon-Fly *or* Libella *of* Penſilvania, *collected from Mr.* John Bartram's *Letters, communicated by* Peter Collinſon, *F. R. S.*

Read Feb. 1. 1749-50.

ABout the Beginning of *May* I obſerved many deformed Water-Inſects, by Naturaliſts called *Hexipodes*, creep up out of the Water, and fix themſelves on the Shrubs and Ruſhes; in this Situation they continue but a few Hours before their Back ſplits open; and from this deformed Caſe creeps out a beautiful Fly, with ſhining tranſparent Wings;

Wings: At its firſt Appearance there is only what one may call the Rudiments of Wings; but it is a moſt entertaining Sight to obſerve how they ſhoot out, and expand themſelves: Thus, in leſs than an Hour, they have attained their complete Dimenſions. During all this Operation the Creatures are immoveable, and ſo continue, until their Wings are dry; and then they fly ſwiftly away, roving about the Sides of Ponds and Rivers, ſeeking their Food, being Inſects of Prey, are very voracious, and, like the Hawks among Birds, are very ſwift of Flight, and nimbly ſecure their Prey, which is moſtly Flies, and ſmall green Graſhoppers: They delight in Sunſhine; in cloudy Weather they are rarely to be ſeen; but ſeek Protection under the Leaves and Boughs of Trees.

Towards the End of *May* the Female is ready to depoſit her Eggs: She then ſeeks the warm quiet Sides of Ponds and Water-courſes, continuing in a hovering Poſture, dodging up and down in the Water: In this Action the Male ſeizes her, and with the End of his Tail catcheth faſt hold by the Back of her Head, and flieth away with her. It is uncertain how long they continue in this Poſition before the Female bends the End of her Body, ſo as to penetrate the Part between the Belly and Breaſt of the Male. —— In this ſingular and ſurpriſing manner ſhe is impregnated; then ſhe repairs again to thoſe ſtill ſhallow Waters, whoſe Bottoms are covered with Moſs, Sticks, and Weeds, which may be a Security to the little Grubs. —— Here ſhe in a hovering Poſture depoſits her Eggs in the Water, which immediately ſink, and find a proper *Nidus*

in

in the aquatic Moſs, *&c.* The Eggs are ſoon hatch'd; the young Reptiles creep amongſt the Stones and Weeds, *&c.* and ſo continue Water-Animals the greateſt Part of the Year, until the Seaſon comes round for their Appearance in that beautiful Fly before you, which is different from our *European*; but their Proceſs I think well agrees with ours, as it is curiouſly deſcribed and delineated by that Excellent Naturaliſt Mr. *Reaumur*. They have a great Variety of this Tribe of Inſects in *America*, as well as we have in *Europe*.

VII. Alberti Halleri *Archiatri & Conſil. Aul. Reg.* Medic. *in Acad.* Gottingenſ. *Prof. & Reg. Soc.* Lond. *Sodal. Experimenta aliqua ad* Reſpirationem *pertinentia.*

Read Feb. 1. 1749-50. CONtroverſia de reſpirationis modo nuper exorta eſt, cujus hiſtoriam hic recenſere nihil attinet. Sufficiat contraxiſſe experimenta in duo capita, quæ ad rem perficiendam ſpectant.

Dubium primum fuit, num muſculi intercoſtales interni elevent coſtas, ut primus veſter *Mayovius* invenit; an deprimant, ut olim *Galenus*, tum *Franciſcus Bayle*, et alii.

Dubium alterum fuit, an aer elaſticus reperiatur

inter pleuram et pulmones, an omnino pulmones pleuræ continui ſint.

Sexaginta fere viva animalia incidi, præter alia experimenta. In iis repertum eſt, quod nunc vobis ILLUSTRES VIRI, propono, rogatoſque volo, ut repeti pericula jubeatis, atque, ſi omnino meis conſentiunt, finem inponatis controverſiæ.

Ad primam quæſtionem. Cani religato nudentur muſculi pectoris, cute remota, in ſuperiori maxime parte, ubi res evidentior eſt. Removeatur præterea pectoralis uterque, et deſtruatur tantum de exterioribus intercoſtalibus, quantum ſufficit ad obſervandam conditionem et actionem internorum.

Utile fuerit animal cogere, ut quam vehementiſſime inſpiret: quod fiet inprimis pectoris altera parte foramine pertuſa, ut aer ſubire, et alterum pulmonem inutilem reddere poſſit. Ita enim animal pulmone ſuperſtite, quam maximo cum conatu utitur. Non tamen neceſſe eſt pleuram perforare, et irritatus canis, etiam abſque ea vi valide reſpirat, ſi alcohole vulnus tangatur.

Adparebit ita, in inſpirando, coſtarum intervalla quam proxime ad ſe invicem accedere, ut ultra medium ſibi propiora fiant, muſculos internos laborare vehementer, tumere, dureſcere, coſtas adſcendere omnes, prima excepta, quæ tantillum movetur, rotari omnes circa punctum imaginarium, quod eſt in appendice cartilaginea haud longe a ſterno, ut coſtæ pars ſterno conmiſſa deſcendat, pars a ſterno remota adſcendat, et extrorſum vertatur.

In expiratione deſcendunt coſtæ omnes, iterum prima excepta, quæ parum nutat; intervalla, in vehementi expiratione, longiora fiunt, et tenduntur, et qui-

quieſcunt interni muſculi. Hæc ad primam quæſtionem.

Ad alteram.

Sumatur animal quodcumque vivum aut mortuum, mergatur ſub aqua, et ſub aqua prudenter, ne pulmonem lædas, pertundatur pleura. Si aer elaſticus eſt inter pleuram et pulmonem, bullæ adſcendent per aquam. Si nullæ adſcendunt, nullus adeſt aer. Id me rectius nôſtis, et ex principiis patet.

Sed repetita ſatis experimenta feci. Bullæ nunquam adparuerunt in ullo experimento, et videor mihi nihil præcipitis corollarii inde deducere, ſi inde concluſero, nullum adeo elaſticum aerem inter pleuram et pulmonem eſſe.

D. Gottingæ, *d.* 6. Jan. 1749.

VIII. *A Letter from Father* Anthony Gaubil *Jeſuit, to Dr.* Mortimer, *Secr. R. S. containing ſome Account of the Knowlege of Geography among the* Chineſe, *and of Paper-Money current there. Tranſlated from the* French *by* T. S. M. D. *and F. R. S.*

Peking *Nov.* 9. 1748.

SIR,

Read Feb. 1. 1749. IT is now ſome time ſince I received from M. *de L'iſle* Part of a Map of the World, found among the Papers of the late Dr. *Kæmpfer*. In this Map were ſeveral *Chineſe*

Characters, ſome well, ſome ill written, which the late Profeſſor *Bayer* had attempted to decypher. —— In my Anſwer to Monſ. *de L'iſle*, I informed him that it was by no means a *Chineſe* Work *; that it could be of no Service to a learned *European*, ſuch as he or you were; and that Mr. *Bayer*'s Explanations were full of Faults. I ſuppoſe that M. *de L'iſle* has already writ you my Thoughts concerning it from *Petersbourg*. You have poſſibly ſeen in ſeveral Books, what the *Chineſe* know, and have ſet down, concerning foreign Countries: And there is no Monument extant to prove, that before the arrival of the Jeſuits in this Country, they had Charts or Maps of the World, any way reſembling that, which you found among *Kæmpfer*'s Writings.

It is now above ſixteen hundred Years ſince they tolerably well knew the Northern and Eaſtern Countries of *India*, and thoſe which lie between *China* and the *Caſpian* Sea. On theſe different Countries their Hiſtory affords ſeveral Informations, which are not to be found in the *Greek*, *Latin*, or other Hiſtorians. They had ſome, but very confuſed, Notions of the Regions beyond the *Caſpian* Sea; ſuch as *Syria*, *Greece*, *Egypt*, and ſome Parts of *Europe*. I do not ſpeak of the Times of *Gentchiſkan* and his Succeſſors; for then the *Chineſe* were made acquainted with *Ruſſia*, *Poland*, *Germany*,

* Doubtleſs it is the Work of an *European*, who was giving ſome Notion of Geography to a *Chineſe* or *Japaneſe*; or perhaps that of a *Chineſe* or *Japaneſe* from Memory of what he had heard from *Europeans*, or of the Map which he might have ſeen with them.

Hungary,

Hungary, Greece, &c. from Accounts given by their own Countrymen who followed that Prince, his Sons, and Grandſons: But the Monuments that remain of this their Knowlege are very confuſed. As to the Countries to the Eaſt of *China*, there are Proofs remaining in Books, that, above ſeventeen-hundred Year ago, the *Chineſe* were well acquainted with the Eaſtern Part of *Tartary* as far as the Sea, and the River *Ameur*, *Corea*, and *Japan*. Their Books ſpeak alſo in general, and without ſufficiently entering into Particulars, of many Countries to the Eaſt and to the North of *Japan*. With regard to the Monuments of the *Cap of Good Hope*, which have been mentioned by ſome, there are none in *China*; and if there have been any, they are now loſt. It was from the *Europeans*, that the *Chineſe* have learnt the Name and the Situation of the *Cape:* [and you will ſoon ſee a Diſſertation, wherein all this Affair will be circumſtantially treated].

I herewith ſend you two Paper Money-Bills; do me the Favour to accept them. Next Year we may poſſibly ſend ſomething to *Canton*, either for you, or for your illuſtrious Society.

I am, with great Reſpect,

SIR, Yours, &c.

A. GAUBIL.

An

An Account of the above-mentioned Bills.

TWO Paper Money-Bills of the Reign of *Hongvou.*

The Year of Chriſt 1368. was the Firſt of the Empire of *Hongvou*, Founder of the Dynaſty of *Ming*. During the Dynaſty of *Yuen* (who were *Mogul Tartars*) which *Hongvou* deſtroy'd, there was a great deal of Paper-Money. There had alſo been ſome, 140 Years before, under the Dynaſty of *Kin* (oriental *Tartars*) who reign'd in the Northern Provinces of *China*, and in *Tartary*. The *Yuens* deſtroy'd this Dynaſty, as well as that of the *Song's*, who were *Chineſe*, that reign'd in the Southern Provinces of *China*. We find no Paper Money of the Dynaſties of the *Yuen's* and *Kin's*; and that of *Hongvou* is ſcarce. The *Bonzes* and *Chineſe* Empirics ſuperſtitiouſly ſay, that this Paper-Money laid upon Children brings them good Luck.

Theſe two Bills are the ſame with thoſe, the Figures and Explanations of which are to be ſeen in Father *du Halde's Deſcription de la* Chine, Tom. II. pag. 168.

I ſend you the Two,* becauſe probably you have none of that Sort.

The late Father *Dentrecolles* formerly ſent to *France* an Account of the *Chineſe* Money, antient and modern: And ſome Notes and Remarks on this Sort of Money were of late Years ſent hence to *Peterſbourg*.

* One of which I preſented to the Royal Society. *C. M.*

IX. *A Catalogue of the fifty Plants from* Chelsea *Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year* 1747, *pursuant to the Direction of Sir* Hans Sloane, *Bar^t.* Med. Reg^r & Soc. Reg. *nuper* Præs. *by* John Wilmer, *M. D. Hort.* Chels. *Præfect.* et *Prælect. Botan.*

Presented Feb. 8. 1749.

1251 ALchimilla Alpina; Quinquefolii Fol. subtus argenteo. *I. R. H.* 508.

1252 Alysso'des incanum; folii sinuatis. *Inst. R. H.* 218.

1253 Alysson Creticum; foliis angulatis; flore violaceo. *T. Cor.* 15.

1254 Alysson Creticum saxatile; foliis undulatis incanis. *T. Cor.* 15.

1255 Asarum. *Dod.* Pempt. 358. *Officin.* 54.

1256 Astragalus luteus annuus Monspeliac. procumbens. *Mor. Hist.*

1257 Borrago Constantinopolitana; flore reflexo cæruleo, calyce Vesic. *T. Cor.*

1258 Buglossum Creticum verrucosum perlatum quibusdam. *H. R. Par.*

1259 Campanula minor annua foliis incisis. *Mor. Hist.* 2. 458.

1260 Caryophyllata montana; flore luteo nutante. *H. R. Par.*

1261 Cataria, quæ *Nepeta* minor; foliis Meliſſæ Turcicæ. *Hort. Cath.*

1262 Chondrilla, Sonchi foliis, flore purpuraſcente, major. *Tourn.* 475.

1263 Clutia foliis petiolatis. *Lin. Hort. Cliff.*

1264 Euonymus vulgaris; granis rubentibus. *C. B.* 428.

1265 Euonymus latifolius. *C. B.* 428.

1266 Eryſiacum Orientale, foliis Sonchi; flore ſulphureo; ſiliquis longiſſimis *Boerh.*

1267 Fritillaria lutea; foliis Polygonati; fructu breviore. *Boerh.* 2.139.

1268 Geranium latifolium; longiſſimâ acu *C.B.*319.

1269 Helianthemum Salicis folio. *T.* 249.

1270 Hermannia fruteſcens; folio oblongo ſerrato. *T.* 656.

1271 Heſperis ſylveſtris inodora. *C. B.* 202.

1272 Heſperis exigua lutea; folio dentato anguſto. *Borh.* 2.20.

1273 Heſperis maritima, anguſtifolia incana. *T.* 223.

1274 Heſperis caule ramoſiſſimo; foliis lanceolatis ſæpius dentatis. *Lin. Hort. Cliff.*

1275 Heſperis flore albo minimo; ſiliqua longa; flore profunde dentato. *Boerh. Ind.*

1276 Lychnis Cretica parvo flore; calyce ſtriato purpuraſcente. *T. Cor.* 24.

1277 Lychnis ſupina Sicula, calyce ampliſſimo ſtriato. *T.* 337.

1278 Leucoium Heſperidis folio. *T.* 221.

1279 Meſpilus Canadenſis, Sorbi torminalis facie, *T.* 642.

1280 Myrrhis major, vel Cicutaria odorata. *C.B.*160. Officin. 321.

1281

1281 Omphalodes Luſitanica, Lini folio. *T.* 140.
1282 Padus Theophraſti, Dalechampio. *Lugd.* 312.
1283 Pavia. *Boerh. Ind. Alt.* 2. 260.
1284 Polygonatum latifolium; Hellebori albi foliis. *C. B.* 303.
1285 Pulmonaria maxima; foliis quaſi ſaccharo incruſtatis. *Pluknet.*
1286 Pulſatilla folio craſſiore; et majore flore. *C.B.* 177.
1287 Ranunculus montanus; foliis Plantaginis. *C. B.* 180.
1288 Scrophularia Hiſpanica; Sambuci folio glabro. *T.* 166.
1289 Scropularia maxima Luſitanica; Sambuci folio lanuginoſo. *T.* 166.
1290 Scrophularia peregrina. *Cam. Hort. Tab.* 43.
1291 Siſymbrium Orientale; facie Barbareæ; foliis Plantaginis. *T. Corr.* 16.
1292 Smyrnium. *Matth.* 773. *Officin.* 457.
1293 Smyrnium peregrinum; folio oblongo. *C. B.* 154.
1294 Sorbus ſativa. *C. B.* 415. *Officin.* 464.
1295 Symphytum majus; tuberoſa radice. *C.B.* 476.
1296 Tordylium minus; limbo granulato; Syriacum. *Mor. Umb.* 37.
1297 Trifolium Clypeatum argenteum. *Alp. Exotic.* 307.
1298 Trifolium montanum; ſpica longiſſima rubente. *C. B.* 328.
1299 Turritis annua verna; flore purpuraſcente. *T.* 224.
1300 Vella. *Lin. Gen.* 654.

X. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to Mr.* Henry Baker, *F.R.S. concerning the green* Mould *on Fire-Wood; with ſome Obſervations of Mr.* Baker's *upon the Minuteneſs of the* Seeds *of ſome Plants.*

Dear SIR,

Read Feb. 15. 1749. I Offer you a ſhort Account of a Microſcopic Object, together with a Specimen of the ſame, for your own Obſervation, at leiſure.

Some Days ago, happening to take Notice of a Quantity of what we commonly call Mould *, on the Bark of ſome Fire-Wood, I had the Curioſity to view it with a Lens, of about an Inch Focus, which I carry about me, when I found it to conſiſt of Numbers of minute *Fungus's*, whoſe regular Appearance invited me to examine them in the Microſcope, with a good Magnifier; upon which their ſpherical Heads ſeemed as if they had been nothing elſe but Globules of Seeds; at the ſame time, I obſerved ſeveral Seeds adhering to the tranſparent Footſtalks, which ſupported the Heads, and many ſcattered on the Glaſs-Plate, whereon the Subſtance was placed, in order to be viewed. And here I had an Oppor-

* Of a bright verdegriſe Colour.

tunity

tunity of ſeeing many diſtinct Seeds, which appeared, nearly, of an oval Form, but ſeveral times larger than the Seeds of common Muſhrooms, even when ſeen with the ſecond Magnifier, and the latter with the firſt.

I pretend not to any Skill in Botany; ſometimes, and, indeed, but ſeldom, I look into an Author on the Subject, as an Amuſement and Relief to my Mind; therefore it would ill become me to attempt the referring this Plant to the proper Claſs. *Micheli*, in his *Nova plantarum genera*, has given us the Draught of ſome, which well repreſent the Figure of them, as they appear, when much magnified, TAB. LXXXII. *Fig.* 1. and in page 200. of his excellent Work, deſcribeth them, under this Title, *Fungoidaſtri ſemine in ſuperna parte donati*: But then his Figures are ſuch as the Plants appear to have, to the naked Eye (as we may preſume), ſince he does not ſay any thing to the contrary; not to mention that there are other different Characteriſtics in his Deſcription. The ſame celebrated Writer deſcribes another Species, p. 215. under the following Title, *Mucores pediculo donati*, which in reſpect of Size, the Subſtance, and ſome other Characters, correſpond with theſe I am ſpeaking of, well enough: But as he refers to Dr. *Hooke*'s Micrographia, TAB. XII. for an elegant Figure of them (beſides what he has himſelf given us TAB. 95.), both Dr. *Hooke*'s and his own Figures repreſent the Heads, as quite ſmooth, on the Surface; and the Doctor, in his Deſcription of them p. 126. expreſly ſays they are of *a ſmooth Surface*. Whence I conclude this muſt be a different Species. However what the ingenious

Author of the *Micrographia reſtaurata* ſays of the Seeds of theſe diminutive Bodies, p. 19. is put out of all doubt.

Permit me to add, that having often viewed the Heads of a ſmall kind of *Fungus*, which are about $\frac{1}{8}$ Inch Diameter, of a coriaceous Subſtance, I have ever found the Seeds which are produced on the Gills) much larger than thoſe of any Muſhrooms I ever examined, tho' rather leſs than thoſe produced by this unregarded Plant.

Now, that a Body whoſe Form is not to be diſtinguiſhed by the unaſſiſted Eye, ſhould produce Seeds ſeveral times larger than another of the ſame *Genus* does, which exceedeth it many Millions of times in Bulk, muſt ſuggeſt thoſe Thoughts to one's Mind, which, I know, I need not point out to you: I ſhall therefore only beg Leave to aſſure you, that I am,

Dear Sir,

Your very much obliged

and obedient humble Servant,

Tooting, *Jan.* 31. 1749-50.

H. MILES.

Some

Some Obſervations on the above-mentioned Plants and Seeds *By* Henry Baker, *F. R. S.*

I Have carefuliy examined the Plants and Seeds ſent me by Doctor *Miles*, in order to determine their real Bigneſs; and, taking the fungous Heads of the middle Size (ſome being larger and others ſmaller), I find, according to my Micrometer, that three of them take up the Side of a Square, 70 of which Squares make an Inch in Length, and conſequently, that 3 times 70, or 210 of theſe *Fungi* are required to make a Line whoſe Length is one Inch; or, in other Words, that the Diameter of theſe fungous Bodies is, at a Medium, the 210th Part of an Inch.

The Seeds are oval; and I find, by the ſame Micrometer, that 10 of them laid by one another the ſhorteſt Way of their Diameter, or 8 of them the longeſt Way, fill up the Side of a Square, 270 of which Squares make an Inch in Length.——Taking therefore 9 at the Medium, 270 times 9, or 2430 of theſe Seeds will be required to make a Line of an Inch in Length; or, in other Words, each Seed is the 2430th Part of an Inch in Diameter.

And according to theſe Calculations 44,100 of the fungous Heads, or 5,904,900 of the Seeds may lie by one another in the Surface of an Inch ſquare.

Yet minute as the Seeds of this little Fungus are, Dr. *Miles* obſerves, very juſtly, that they are larger than the Seeds of ſome Muſhrooms, which exceed it many Millions of times in Bigneſs. As to which, I beg Leave to take Notice, that the Proportion, in Size of the Fruits or Seeds of Trees or Plants, to the

the Size of the Trees or Plants that bear them, comes under no Regulations that correſpond with our Conceptions. For the vaſt Bulk of ſome ſorts of Timber-trees (the Beech and Aſh, for Inſtance) is produced from a Seed ſmaller than that of the common Garden Bean. The towering and mighty Oak produces for its Fruit only a little Acorn, whereas the Pumpkin (ſome whereof weigh above an hundred Pounds) is the Production of a feeble creeping Plant, unable to ſupport itſelf, and much leſs its enormous Fruit. The *Vanilla* (a Plant that riſes to the Height of ſeveral Feet, by claſping about whatever it finds near it) produces, in long Pods, Seeds ſo ſmall, that their Diameter is not more than the 100th Part of an Inch. Suppoſing therefore the Cavity of the Pod to be equal to a cylindrical Tube of $\frac{1}{10}$ of an Inch Diameter, and the Length of the Pod to be ſix Inches (which Dimenſions are taken with great Moderation) the Number of Seeds contained in one ſingle Pod will be more than 47000. Moſt Kinds of Fern, of which ſome are pretty large Plants, bear Seeds ſo extremely minute, that they appear to the naked Eye only like a fine Duſt; while Seeds of a conſiderable Bigneſs are produced by Plants of a great deal ſmaller Size. But many of the Gentlemen here preſent are ſo much better acquainted with theſe Matters than I can pretend to be, that I ſhall only preſume to add, with how much Zeal I am

The Royal Society's

London, Feb. 7.
1749-50.

Moſt devoted and obedient
humble Servant
H. BAKER.

XI. *An Obſervation of the* Eclipſe *of the* Sun *on* Jan. 8. 1750. *N. S. taken at the Obſervatory at* Berlin, *by M.* Griſchow *jun. and M.* Kies. *Tranſlated from the* French.

Read Feb. 15.

1749-50.

	h	′	″	
THE Beginning was at	8	59	19½	true Time.
The End of the Eclipſe at	11	20	5¼	
The whole Duration	2	20	46	

The Obſervations were made with the greateſt Exactneſs, the Weather being as favourable as could be wiſhed, the whole Time.

M. *Euler* obſerved in his own Houſe, which ſtands a little to the Weſt of the S. W. of the Obſervatory, at the Diſtance of 190 *Rhinland* Yards (*Verges*) in a ſtrait Line, that

	h	′	″	
The Beginning was at	8	58	30	true Time.
And the End at -	11	19	50	
The whole Duration	2	21	0	

That is, 34″ more than at the Obſervatory.

The Diameter of the Umbra was 6½ *Rhinland* Inches.

XII.

XII. Alberti Haller, *Archiatri et Conſil. Aul. Reg. in Acad.* Gottingenſ. *Medicinæ Prof. necnon R. S.* Lond. *Sodalis, Obſervationes* de Viis Seminis.

Read Feb. 15. 1749-50. CUM in teſtium veſicularum fabrica aliqua mihi contigerit inveniſſe, quæ non inutilia videantur, ea Vobis, Sodales Illuſtres, conſideranda propono, quorum anteceſſoribus pene ante centum annos *Claudius Uberius* aprugni teſtis fabricam dicavit *Phil. Tranſ.* n. 42.

Teſtium quidem filamentoſa fabrica ex flaveſcentibus vaſculis compacta, paſſim nota eſt. Ea vero vaſa quæ ſemen confectum in iis vaſculis exportant, et ad epididymidem convehunt, ea quidem ſemper dubia fuerunt.

Solus hactenus *Regnerus de Graaf* ad veritatem cominus acceſſit; recentiores ſcriptores infra ejus inventa ſubſtiterunt.

Repleatur ergo epididymis per ductum deferentem, lente et prudenter, argento vivo, ſubſiſtendo ſubinde, aut in calidam mergendo teſtem, ut ſenſim vaſa expanſa cedant; nam ſubita repletio facillime mediam aut ſummam epididymida rumpit.

Ita mihi duodecies aut ultra adparuit, epididymidem quidem per totam longitudinem ſuam, qua teſti adhæret, capite excepto, unicum ſubtilem canalem eſſe, qui explicari queat, et ex plicis per celluloſam revinctis reſolvi. Recte hoc vidit, quem laudavi *Graafius de part. genit. vir.* p. 65. T. 1. f. 2.

In ſuprema parte epididymidis, quam caput vocavit, (TAB. II. *Fig.* 1. *d*) et quæ validius albug incænectitur, fabrica

fabrica alia eſt: Ibi enim unicus iſte canalis finditur in decem, duodecim, forte plures canales, qui nonnunquam valde ſubtiles, alias autem ipſo ductu, qui epididymidem complicatus fuit, multo craſſiores ſunt. Hos canales vocabimus, brevitatis cauſa, *Vaſa efferentia ſemen* (F. 1. *eeeee*).

Singulum plicatum et in conum congeſtum proprium faſciculum efficit, et retrogrado ductu verſus inferiorem partem teſtis redit, intraque albugineum in teſtis partem venit, quæ media eſt inter ſummam partem imamque, qua etiam parte epididymis ab altero latere libera, ab altera unice adhæret. Hæc vaſa conoſque ſatis recte repræſentavit idem *R. de Graaf*, T. 3. f. 3. T. 11. f. 1. In icone noſtra diducta exprimuntur (F. 1. *f f*). Ea vaſa ſenſim in teſtis ſuperficie, quæ albugineæ continua eſt, exporriguntur, et ſibi parallela et conjuncta *rete* efficiunt. (F. 1. *gg*)

Ex ea conjunctione fit, ut non raro uno vel duobus tantum vaſculis efferentibus ab epididymide repletis omnia turgeant, et argentum vivum manifeſto per ea vaſa, quæ argentum receperunt, retrogrado metallo etiam in ea parte, quæ teſti proprior eſt, repleantur. Hoc rete ea fere longitudine eſt partis ſemiliberæ ductus epididymidis. Solus eam vidit *Graafius* et depinxit T. 4. f. 4. ut tamen parallela nimis vaſcula, neque mediis ramis conjuncta, aut pingat aut deſcribat. Nimis etiam longa et paria fere teſti fecit. Reliqui Anatomici omnes aut pro ductu unico, aut pro cæca membrana habuerunt.

Ab eo rete in teſtis carnem muſculoſam cum ſingulo celluloſo ſepto, ſingulum vaſculum venit, et ad eam teſtis diviſi provinciam deſcendit. Hæc vaſcula abſque plicis ſunt ampliora multo quam crederes, et

quàm epididymidis, magis vaſculum tenera, ut a pondere argenti vivi facile rumpantur. A rectitudine *recta vaſcula teſtis* voco.

Hæc recta vaſcula inſerta ſibi recipiunt *vaſcula teſtis ſerpentina* flaveſcentia, quæ adeo pulchre in capillos reſolvebat *Ruyſchius*. Aliquoties contigit, ut fluidum metallum etiam hæc tenerrima vaſcula ſubiverit, ut omnino cavos canales eſſe minime dubitari poſſit.

Ea eſt adeo teſtis fabrica, ut in *ſerpentinis vaſculis* ſemen flaveſcens generetur, id deponatur in vaſa *recta*, inde in *rete* ſub albuginea poſitum, tunc per *vaſcula efferentia* tortuoſa in epididymidem veniat.

Ex epididymide duplex via eſt ſeminis, altera recondita, de qua nunc dicendi locus eſt, altera vulgo nota ad veſiculas.

Illam argento vivo immiſſo nunc ter omnino detexi.

Vaſculum unicum, nec enim plura vidi, de media epididymide decedit, in rectitudinem exporrigitur, una cum vaſis teſtis adſcendit, nunquam ad finem uſque a me deductum, ſed proculdubio ad lymphatica vaſa pertinens, quæ ſæpe in funiculo vaſorum ſpermaticorum humano vidi. Hæc ſunt vaſcula minima in abdomine, quæ per vas deferens replebat in lepore, *Ruyſchius Catal. Muſ.* p. 152. Nam etſi unicum hactenus vidi, minime repugno plura eſſe. Reſorbendo humori, adeoque craſſiori reddendo ſemini, deſtinari valde probabile fit.

Altera via manifeſta eſt, qua ad veſiculas ſeminales ſemen ducitur; in ea Mercurius injectus aliqua etiam nobis patefecit.

Non quidem valde urgebo ductum deferentem recta in urethram continuari, huic ad angulum valde acutum

acutum inſeri ductum excretorium veſiculæ ſeminalis, qui ductu urethrico minor eſt (Fig. 2. *o p*); et tamen liquores injectos in ductu deferente facile in veſiculam ſubire. Hæc enim vulgo nota ſunt.

Neque monebo fuſe ex ductu deferente, cujus pars, quæ veſicæ ſubjicitur, in cellulas plicatur, argentum vivum in urethram facile delabi, quod non ita de ſemine obſervatur unquam, ut in vivo homine potentiam aliquam eſſe neceſſe ſit, quæ extra tempora venerei œſtri coerceat ſemen, neque ſinat in urethram ſani hominis venire, quin prius in veſiculam adſcenderit. Ea potentia poteſt in ipſa denſitate conprimentis proſtatæ poni, vel in alia cauſa, nobis ignota.

Sed id inprimis volo, veſiculam ſeminalem quamlibet unicum eſſe inteſtinulum, cui multæ cæcæ appendices inſerantur. Id adparet, quando Mercurio vel cera repleta veſicula reſolvitur, diſſectis patienter telis celluloſis, quæ et princeps inteſtinulum, et cæcas appendices religant. Sæpe præparavi, multum inveni in appendicibus diverſitatis, in longitudine, ſimplicitate, directione, diametro. Hæc tamen communia ſunt. Inteſtinulum princeps veſiculæ (*l l*) in craſſum obtuſum cæcum conum terminatur. In hoc inteſtinulum octo, decemve inſeruntur appendices (*m m n n*), quarum primæ ſolent ramoſæ eſſe (ut *m n*), non tamen conſtanter; ultimæ potius ſimplices ſunt (ut *m m*). Aliquid ſimile et *Leal. Lealis* vidit, et *Henricus Baſſius, Obſerv. Anat. Chir. Dec.* 1. n. V. T. 2. *f f*; ſed ille nimis breves appendiculas fecit, tum iſte, anulumque is præterea addidit, quem certo novi plicam eſſe, non verum circulum. Unice addo, adeo magnas et compoſitas appendices me vidiſſe, ut quæ truncus ſit, quæ appendix, non facile definires.

ICONUM EXPLICATIO.

TAB. II.

FIG. 1. *Teſtis Mercurio repletus.*

a Ductus deferens, ſenſim complicatis vaſis.
b Pars ima, ubi contra ſeipſum adſcendere incipit cum epididymidis nomine.
c Epididymis tota repleta ex ſerpentino vaſculo compoſita.
d Caput epididymidis diſſolutum.
e e e e e Totidem coni vaſculoſi, in quos caput epididymidis reſolvitur.
f f Vaſcula efferentia ſemen ex conis orta, pauca notavi literis, ne iconem corrumperem.
g g Rete teſtis.
h h Aliquot ductus rectilinei. Reliqui globuli diſſoluti ſunt ab argento vivo, per rupta aliqua vaſcula effuſo, quos volui expreſſos, ne quidquam veritati iconis decederet.
i Caro teſtis nuda.

FIG. 2.

a a Veſica urinaria.
b Fibrarum longitudinalium planum poſterius.
c Proſtata.
d d Ureteres.
e Arteriæ veſicularum.
f g Ductus deferentes in celluloſo fine ſuo.
h Veſicula ſeminalis dextra, non mutata.
i Ductus ſeminifer, qui proſtatam perforat.
l Veſicula ſeminalis ſiniſtra cera repleta et expedita. Diſſolutis corniculis hinc multo longior.

m m Cæcæ appendices veſiculæ, quæ in hoc cadavere breves fuerunt.
n n Appendices aliquæ ramoſæ.
o Ductus ſeminifer per proſtatam euns.
p Ductus veſiculæ excretorius ipſi inſertus.

XIII. *A Letter from* John Martyn, *M. D.* Prof. Botan. Cantab. & F.R.S. *to the Preſident, concerning an* Aurora Borealis *ſeen* February 16. 1749-50.

SIR, *Chelſey*, Feb. 21. 1749-50.

Read Feb. 22. 1749-50. ON *Friday* the 16th there was a bright *Aurora Borealis*, the Northern Part of the Sky being intirely filled with a pale Light, in which frequent Coruſcations were viſible. Beſides theſe Lights, there was a perfect uniform Arch, extending from Eaſt to Weſt: the Colour of it was the ſame with that of the *Aurora*; with which however it did not ſeem to have any Communication, being placed ſeveral Degrees to the Southward. The Shoulders of *Orion* were viſible thro' this luminous Arch, in the Weſtern Part of it; and *Cor Leonis* in the Eaſtern Part. I did not happen to ſee it till about a Quarter before Ten; and at Ten it diſappeared. The Weather was then, and has been ever ſince, exceedingly warm for the Seaſon. The Walls are covered with Bloſſoms; and the Hyacinths, Daffodils, *&c.* are blown before the uſual time. I am, with the greateſt Reſpect,

SIR,

Your moſt humble Servant,

JOHN MARTYN.

XIV. *A Letter from the Rev.* Henry Miles, *D. D. and F. R. S. to* Henry Baker, *F. R. S. concerning an* Aurora Borealis *ſeen* Jan. 23. 1750-51.

Dear Sir,

Read Feb. 22. 1749. ON *Tueſday*, 23d of *January* laſt, I was called out, about Six in the Evening, to ſee a ſtrange Appearance in the Sky, in the Weſt. Suſpecting it to be an ordinary *Aurora*, I did not make great Haſte—When I came out, I ſaw a Cloud (not large) of an obſcure red Colour, but much deeper than any I had ever ſeen before, which, I was informed, roſe from the S. W. it was then advancing apace to the N. E. and quickly reached the Zenith, when, it being intercepted by the Houſe, I haſtened to the other Front, which regards the N E. by which time there appeared a luminous Zone, about the Breadth of the Galaxy, its Edges regularly defined, compaſſing the Hemiſphere, from the Horizon in the N. E. to the Zenith, in the ſame Direction, in which the above-mentioned Cloud had paſſed (as far as I ſaw its Courſe) from the S. W. The Colour was much fainter, and more luminous, reſembling the uſual Colour of an *Aurora*, and the *Laminæ* or Streamers ſoon appeared—upon this, not being well fenced againſt the Wind, which blew brisk, I went in, to purſue my Intention of viewing the two beautiful Planets, *Jupiter* and *Venus*, with a reflecting Teleſcope, made by my ingenious Friend Mr. *Short* of *Surrey-ſtreet* (the greateſt magnifying Power of which is about 200 Times); and after I had viewed

viewed them to my Satisfaction, and ſhewed them to ſome Friends, when I was about to put up the Inſtrument, a Cloud, of near the Size of the firſt, but not ſo deep a Colour, appeared, riſing up from the S. W. which proceeded in a Line with the Planets, and, in a little time, ſurrounded both: *Venus* appearing ſtill, to the naked Eye, in her full Luſtre, I immediately viewed her with the Teleſcope, without altering the *Focus*, and ſaw her much more diſtinctly than ever I had done, on that Evening, or on any other, and of the ſame Opinion were all my Friends as to the Sight they had of her, on that Occaſion: We all ſaw her Spots plain, reſembling thoſe in the Moon; which I was never ſo happy as to have a Sight of before—and this, while the Cloud ſeemed to ſurround it, as much as ever: But whether the Vapour might be really rarer near the Planet, than it was at ſome Diſtance, no Judgment could be made, becauſe of her too powerful Light.

Many have obſerved the fixed Stars to appear thro' the Vapour with an undiminiſhed Light oftentimes: And our great Dr. *Halley* tells us, in his Account of that remarkable *Aurora*, which was ſeen in *March*, 1715-16. that he obſerved "one of the *Laminæ* "paſs ſucceſſively over all the Stars of the litte Bear, "without effacing the ſmaller ones, in the Tail, of "the fifth Magnitude; ſuch was the extreme Rarity "and Perſpicuity of the Matter whereof it conſiſted." *Phil. Tranſ.* N° 347.

I had the Honour this Week to receive a Letter from Dr. *Short* of *Sheffield*, the Author of an Account of ſeveral Meteors, in the *Phil. Tranſ.* N° 459. in which he ſays, "The 23d paſt, at Six at Night, the

"Sky

" Sky being overclouded, all the Clouds over the " Hemiſphere, turned of a ſudden to a deep blood- " red Colour, for fifteen Minutes; then ſucceeded red " Streamers for half an Hour."

Tooting, Feb. 16. 1749-50.

I am your, and the Royal Society's, moſt obedient Servant,

H. MILES.

XV. *A Letter from Mr.* William Watſon, *F. R. S. to the* Royal Society, *declaring that he as well as many others have not been able to make* Odours *paſs thro' Glaſs by means of* Electricity; *and giving a particular Account of Profeſſor* Boſe *at* Wittemberg *his Experiment of* Beatification, *or cauſing a* Glory *to appear round a Man's Head by* Electricity.

GENTLEMEN,

Read Mar. 1. 1749-50. THE Inquiry into the Nature and Properties of Electricity has been, within theſe few Years, the Purſuit of many excellent and ingenious Perſons; and moſt of its extraordinary Phænomena, which have been made to appear in one Place, have, with proper Attention to the requiſite Circumſtances, appeared in others: But there

there have happened two very remarkable Exceptions to this Rule. The firſt is, that the Odours of odoriferous Subſtances do not only pervade, from Friction, the Glaſſes which contain them, but that theſe Odours were carried along with the Current of Electricity into ſuch non-electric Bodies as were deſtined to receive them, and manifeſted themſelves in thoſe Bodies by communicating to them their Smell, and other Properties. Theſe, and other things yet more extraordinary, were ſaid to have been performed by Mr. *Pivati* at *Venice*, and to have been repeated by Mr. *Winkler* at *Leipſick*; but, though no Care or Expence has been ſpared, either by Abbé *Nollet* at *Paris*, Mr. *Jallabert* at *Geneva*, Mr. *Boſe* at *Wittemberg*, *Pere Garo* at *Turin*, and by myſelf at *London*, to bring about the ſame Effects, they have hitherto been unſucceſsful. For which Reaſon the Truth of theſe Relations has been greatly queſtioned by many; as Mr. *Buccamare*, in a * Treatiſe ſince publiſhed, ſays, that Mr. *Pivati* confeſſed to thoſe, who addreſſed themſelves to him to ſee the Experiments, that more eſpecially made with Balſam of *Peru*, that it never ſucceeded but once, and that he could never repeat it. I likewiſe received Yeſterday a Letter from our worthy Brother Abbé *Nollet*, who is juſt returned to *Paris* from *Turin* and *Italy*. He ſays, that his firſt Care was to inqure into the Truth of thoſe Wonders in Electricity, of which we have heard ſo much for almoſt three Years, and which have not ſucceeded either with himſelf or me: And he imagines the Royal Society would be glad to

* *Tentamen de vi Electric.* &c. p. 183.

know what they really were: For which Reaſon he has juſt now ſent a Memoir to the Duke of *Richmond*, in which will be ſeen the moſt circumſtantial Account he has been able to procure of them at *Turin*, at *Venice*, and at *Bologna*. For his own Part, he thinks that there has been a great deal of Prejudice, Credulity, and Exaggeration; to which may be added, very little Care and Caution in making theſe Experiments. He is now ſorry he has loſt ſo much time in attempting to make them; and thinks Mr. *Winckler* has been too haſty in aſſerting, that he had repeated theſe *Italian* Experiments: But why ſhould he call them *Italian*, when the Nation he ſays will not allow the Appellation, and except three Perſons, he finds there no Defender of what has been ſaid to be done; and adds, that there is not a Philoſopher of Repute there, who believes them any more than himſelf?

This Experiment then ſeems not to arrive at what we have been told; but, for further Information, we muſt wait till the Reception of Abbé *Nollet*'s Memoir.

The other is, an Experiment called by Profeſſor *Boſe* at *Wittemburg*, the *Apotheoſis* or Beatification. The making this Experiment, in the Manner mentioned by this Gentleman in his Writings, has been attained to by none. He ſays, if in electriſing you employ large Globes, and place a Man upon a large Cake of Pitch, by little and little a lambent Flame ariſes from the Pitch, and ſpreads itſelf around his Feet; from hence by Degrees it is propagated to his Knees, his Body, and at laſt to his Head: That then by continuing the Electriſation the Man's Head is

ſur-

ſurrounded by a Glory, ſuch a one in ſome meaſure, as is repreſented by Painters in their ornamenting the Heads of Saints: That in this State if the electriſed Man is touched by one that is not, the Pain felt by both is very ſevere, reaches from the Finger to the Shoulder, and remains a long time. Profeſſor *Boſe*, in another Part of his * Writings, ſays, That the Beatification indeed does not always ſucceed with him; that ſometimes, when other Circuſtances have been very favourable, a Man will be beatified by one Sphere in two Minutes; at other times, two or three Globes will not do it under ſix or eight Minutes; and even at ſometimes after twenty Minutes, when five or ſix Globes were made uſe of, no Light has been viſible: That under the ſame Circumſtances, when one Perſon was capable of being beatified, another was not. This is a ſhort Account of Profeſſor *Boſe*'s Beatification, given in his Writings, in which, nevertheleſs, nothing of what he ſays eſſential to the Operation is omitted.

This Experiment, which was not only a deſirable Thing to be ſeen, but as it ſeemed to communicate to non-electric Bodies a greater Quantity of Electricity than any other did, that of *Leyden* excepted, I was very deſirous of repeating: But though I omitted no Trouble, and varied not the leaſt Circumſtance, that could any ways conduce thereto, I was diſappointed. I tried the combined Force of many Globes, of different Machines, in the beſt Weather, and with different Perſons, but no Radiation in the manner beforementioned. When I underwent this Operation my-

* De Electricit. comment. novus, pag. xvi.

ſelf, ſupported by ſolid Electrics *per ſe* of more than three Feet high, and as much diſtant from the Sides of the Room as poſſible to prevent the eſcaping of the electric Matter, I found in myſelf, as ſeveral others did, a tingling upon the Skin in my Head, and in many Parts of my Body ſuch a Senſation as would be felt from a vaſt Number of Inſects crawling upon our Bodies at the ſame time; but I conſtantly obſerved this Senſation to be greateſt in thoſe Parts of my Body which were neareſt any Non-electric; but ſtill no Light upon the Head, though to make the Eye more ready to obſerve it, this Experiment was made in the Dark for ſome Continuance. The Senſation of the Snaps in this State were very acute. If the Hand of a Byſtander was brought near the Back of the Hand of the Perſon electriſed, the Hairs thereupon ſent forth a great Number of luminous Points; and if a Bunch of fine Lace Wire was placed upon his Head, you ſaw a great deal more of the ſame Appearance; but this was always moſt brilliant in thoſe Parts neareſt the Non-electric, and ſtill more, when the Non-electric was brought to a proper Diſtance. But this was vaſtly ſhort of that mentioned by Mr. *Boſe*, not only in its Luſtre, but as it never was general, hardly ever ſhewing itſelf in two Parts of the Body at the ſame time. This want of Succeſs after many Trials, as I by no means doubted Mr. *Boſe*'s Veracity, induced me to conclude, that either ſome very eſſential Part of the Apparatus had been ſuppreſſed by the Author, or that the Air of *Germany*, being upon the Continent, was more dry, and more fit, than that of our Iſland. It was difficult indeed to allow this laſt,

laſt, as the Experiment had failed here, after the long Continuance of a very dry Seaſon. This want of Succeſs occaſioned many Perſons here, well verſed in theſe Matters, to conclude, that the Experiments in Electricity had been carried further in *Germany* than in *England*.

However, ſometime after, I found that this Experiment, in the Manner before mentioned, had been made no-where upon the Continent, *Wittemberg* excepted; and our worthy Brother Mr. *Jallabert* at *Geneva*, in his excellent * Treatiſe upon Electricity, ſays, That he had likewiſe attempted it; but inſtead of Beatification, he ſaw from the Hair of the Head of the Perſon electriſed, eſpecially from the back Part thereof, a great Number of luminous Points. Theſe, he ſays, were likewiſe obſervable upon his Cloaths, which were made of a Mixture of Thread and Cotton, more eſpecially upon their Borders. When the Perſon electriſed changed his Situation upon the Pitch, upon which he ſtood, the Place he left appeared luminous. What this Gentleman mentions beſides is very near alike to what I myſelf experienced, and what I have juſt now related. He ſays likewiſe, That he believes Mr. *Boſe* had been the only Perſon, who had made the Beatification ſucceed.

A Perſon here however, that we ſhould not even ſeem to be outdone by our Neighbours, exhibited to the Public the famous Experiment of *Beatification*, found out, as he ſays, by a *German* Profeſſor. Whether he knew how this Experiment was ſaid to be

* *Experiences ſur l' Electricité.* p. 50.

done,

done, or whether it was with him as with many of the Diſcoverers of the Longitude, and of the Quadrature of the Circle, I do not determine; but thus it is, that his Experiment has been exhibited as Mr. *Boſe*'s for two or three Years.

I am unwilling to be thought to detract from the Merit of this Experiment, which I think a very beautiful one; but I take upon me to ſay, that it differs as eſſentially from every Part of that, ſaid to have been made by Profeſſor *Boſe*, as any two electrical Experiments ſoever.

In a Letter, I wrote the Beginning of laſt Year, to my Correſpondent Mr. *Boſe*, among other things, I acquainted him of my not being able to make the beatifying Experiment ſucceed; and that, as far as I had yet heard, nobody any-where had been able to do it, ſo that the Power of ſeeing this extraordinary Phænomenon was yet with himſelf alone. I deſired of him further, that if any material Part of the Proceſs had been omitted in his Writings, he would communicate it; for that ſome People here were not quite ſatisfied of its having ever been made. To this he was ſo obliging as to ſend an Anſwer nearly in the following Words, "As to my Beatification, "I am highly obliged to you for writing to me ſo "freely and candidly about it; and I will diſcover "to you my whole Artifice without any Retention, "though I concealed the ſame from all my Friends "and Correſpondents: But, Sir, it is true, that I "have embelliſhed a little my Beatification by my "Stile and Expreſſions; but it is alſo true, that "the Baſis of the Phænomenon is conſtant. I "found in our Armoury at *Leipzig*, a whole Suit "of

" of Armour, which was decked with many Bullions " of Steel; ſome pointed like a Nail; others in " Form like a Wedge; others pyramidal. In the " dark, you well know, that not all, but very many, " of the ſaid Bullions will ſparkle and gliſter with " Tails like Comets: And it is clear, that when the " Electricity is very vigorous, the Helmet upon the " Head of the Perſon electriſed will dart forth Rays " like thoſe round the Head of a canoniſed Saint; " and this is my Beatification. You are the firſt, Sir, " with whom I truſt my Myſtery, which if you " communicate to the *Royal Society*, I hope you " will take care of its being inſerted in the *Philo-* " *ſophical Tranſactions*, that the Beatification did " not ſucceed until I communicated my Method. " Many People have imagined this Experiment " of mine to be extravagant and falſe. If the " Armour is not ornamented with Steel Bullions, " I believe it will not ſucceed. If the Armour is " well enriched with Bullions, and well poliſhed, " the Comets appear twice, once in the Air, and " once by Reflexion from the Armour. A Sto- " macher, or a Doublet, ſet with Nails or Needles, " will exhibit a ſmall Degree of Beatification."

Thus far Mr. *Boſe*, to whom I am very much obliged, for the Diſcovery of his Proceſs; I cannot but be ſorry for his having, as he ſays, embelliſhed his Relation by his Stile and Expreſſions. The Language of Philoſophers ſhould not be tainted with the Licence of the Poets; their Aim in the communicating their Diſcoveries to the World, ſhould be ſimple Truth without deſiring to exaggerate; as we conſtantly ſee enough to raiſe our Admiration every

Step

Step we take in inveſtigating the Operation of Nature.

The electriſing a Man in poliſhed Armour, with ſeveral Globes, muſt exhibit a very beautiful Phænomenon, by the Electricity running off from ſeveral of the Points; but I cannot but ſay, it muſt fall greatly ſhort of the general Radiation promiſed and expected from the preceding Accounts.

This, Gentlemen, is the Information I have been able to procure, concerning theſe two Experiments, of which we have heard ſo much, and which I apprehended would not be unacceptable to be laid before you. I am glad of every Opportunity of teſtifying the Regard, wherewith I am

Your moſt Obedient

March 1. 1749. *Humble Servant,*

W. WATSON.

XVI. *Part of a Letter from Mr. Profeſſor* Euler *to the Reverend Mr.* Wetſtein, *Chaplain to his* Royal Highneſs *the Prince, concerning the Contraction of the Orbits of the* Planets. *Tranſlated from the* French *by* T. S. M. D. *and F. R. S.*

Berlin, *Dec.* 20. 1749.

Read March 1. 1749. YOU have done me much Honour in communicating an Extract of my laſt Letter * to the illuſtrious *Royal Society, No-*

* See *Philoſ. Tranſ.* No. 493. p. 203.

vember

vember 2. 1749. I am ſtill thoroughly convinced of the Truth of what I advanced therein, that the Orbs of the Planets continue to be contracted, and conſequently their periodical Times grow ſhorter. But in order to put this Fact out of Doubt, we ought to be furniſhed with good ancient Obſervations, and alſo to be very ſure of the Time elapſed, ſince thoſe Obſervations, to this Day: Which we are not, with regard to the Obſervations that *Ptolemy* has left us. For Chronologiſts, in fixing the Moments of thoſe Obſervations, run into a Miſtake, by ſuppoſing the Sun's mean Motion to be known; which ought rather itſelf to be determined by theſe ſame Obſervations. Now, if we reduce the Days marked by *Ptolemy* to the *Julian* Kalendar, we run the Riſque of committing an Error of a Day or two, in the whole Number of Days elapſed, from that to our Time; becauſe the Courſe of the *Julian* Years, according to which every fourth ought to have been *Biſſextile*, has been frequently interrupted by the *Pontifices*; of which we find ſome ſure Marks in *Cenſorinus* and *Dion Caſſius*. Wherefore it might well happen, ſince the Times mark'd by *Ptolemy*, that there has really been a Day or two more than we reckon, and conſequently, that *Ptolemy*'s Equinoxes, ought to be put a Day or two back; which would lengthen the Years of thoſe Times. I was in hopes, that the *Arabian* Obſervations would not be liable to this Inconvenience; becauſe the *Julian* Kalendar has not been interrupted for theſe laſt paſt twelve hundred Years. The late Dr. *Halley* had alſo remark'd, that the Revolutions of the Moon are quicker at preſent than they were

in the Time of the ancient *Chaldeans*, who have left us ſome Obſervations of Eclipſes. But as we meaſure the Length of Years by the Number of Days, and Parts of a Day, which are contained in each of them; it is a new Queſtion, Whether the Days, or the Revolutions of the Earth round its Axis, have always been of the ſame Length. This is unanimouſly ſuppoſed, without our being able to produce the leaſt Proof of it: Nor indeed do I ſee, how it could be poſſible to perceive ſuch an Inequality, in caſe it had really exiſted. At preſent we meaſure the Duration of a Day by the Number of Oſcillations, which a Pendulum of a given Length makes in this Space of Time: But the Ancients were not acquainted with theſe Experiments, whereby we might have been informed, whether a Pendulum of the ſame Length made as many Vibrations in a Day formerly as now. But even tho' the Ancients had actually made ſuch Experiments, we could draw no Inferences from them, without ſuppoſing, that Gravity, on which the Time of an Oſcillation depends, has always been of the ſame Force: But who will ever be in a Condition to prove this Invariability in Gravity? Thus, even ſuppoſing that the Days had ſuffered conſiderable Changes; and that Gravity had been altered ſuitably thereto, ſo that the ſame Pendulum had always completed the ſame Number of Vibrations in a Day; it would nevertheleſs be ſtill impoſſible for us to perceive this Inequality, were it ever ſo great. And yet I have ſome Reaſons, deduced from *Jupiter*'s Action on the Earth, to think, that the Earth's Revolution round its Axis continually becomes more and more rapid. For the Force of

Jupiter

Jupiter ſo accelerates the Earth's Motion in its Orbit round the Sun, that the Diminution of the Years would be too ſenſible, if the diurnal Motion had not been accelerated nearly in the ſame Proportion. Wherefore, ſince we hardly at all remark this conſiderable Diminution in the Years, from thence I conclude, that the Days ſuffer much the ſame Diminution; ſo that the ſame Number will anſwer nearly to a Year.

XVII. *A Catalogue of the fifty Plants from* Chelſea *Garden, preſented to the Royal Society, by the worſhipful Company of Apothecaries for the Year* 1748, *purſuant to the Direction of Sir* Hans Sloane, *Bart.* Med. Reg. et Societat. Reg. *nuper* Præſ. *by* John Wilmer, *M. D.* Clariſſ. Societat. Pharmaceut. Lond. Soc. Hort. Chelſean. Præfect. et Prælect. Botan.

Read March 8. 1749

1301 AButilon, Lavateræ flore, fructu criſtato. *Hort. Elt.*

1302 Acetoſa rotundifolia repens Eboracenſis, folio in medio deliquium patiente.

1303 Agrimonoides *Column. Ec.* 1. 145.

1304 Alyſſum fruticoſum incanum. *Turnfort.*

1305 Ananthocyclus, coronopi folio. *Vail.*

1306 Anonis purpurea, ſpicata, alopecuroides major *Boerh.*

1307 Asarina caule erecto ramoso, foliis oblongis acutis sessilibus, floribus erectis.
1308 Astragalus annuus, angustis floribus, pediculis longis. *T.*
1309 Astragalus orientalis altiss. Galegæ foliis. *T.* 602.
1310 Astragalus luteus, perennis procumbens vulgaris sive Sylvestris.
1311 Brunella major, folio non dissecto. *C. B.* 260. *Off.* 386.
1312 Brunella folio laciniato. *C. B.* 261.
1313 Buglossum Creticum majus, flore cœruleo purpurante. *H. R. Par.*
1314 Campanula minor, foliis incisis. *H. L. B.*
1315 Cataria minor Alpina. *T. Inst.* 202.
1316 Cerinthe minor, flavo flore. *C. B.* 258.
1317 Chenopodio-morus minor. *Boerh. Ind.* 91.
1318 Cistus ladanifera Hispanica, flore albo macula punicante insignito.
1319 Commelina radice Anacampserotis. *Hort. Elt. Tab.* 79.
1320 Cornus foliis lanceolatis acutis subtus incanis, umbellis minoribus.
1321 Coronilla leguminibus teretibus articulatis erectis *Fl. Leyd.* 387.
1322 Cynoglossum Creticum argenteo folio. *C. B.*
1323 Helianthemum foliis Sampsuchi, capitulis valde hirsutis. *J. B.*
1324 Hieracium amygdalas amaras olens, flore suave rubente. *C. B.* 127.
1325 Hypecoum latiore folio. *T.* 230.
1326 Jacea cinerea laciniata, flore purpureo. *Triumfet.*
1327 Jacea Spinosa Cretica. *Zanon.*

1328

1328 Lathyrus tuberoſus arvenſis repens. *C. B.*
1329 Lilium convallium, flore pleno variegato, *Didac. T.* 77.
1330 Linaria triphylla minor, lutea, floris vexillo et calcari purpureo. *B.*
1331 Malva Alexandrina Alchimillæ folio. *Sherard.*
1332 Malva, viſcus arboreſcens, flore miniato clauſo. *Hort. Elt.*
1333 Marrubiaſtrum limbo atro-purpureo, *&c.*
1334 Meſpilus Virginiana, Apii folio, vulgari ſimilis, major.
1335 Mollugo foliis verticillatis, cuneiformibus acutis. *Hort. Upſal.*
1336 Myagrum, ſiliculis obverſe ovatis, lateribus depreſſis. *Fl. Lugd.*
1337 Myrrhis lutea daucoides. *Mor. H. R. Bleſſ.*
1338 Ornithopodium portulacæ folio. *T.* 400.
1339 Polygonatum caule purpuraſcente. *Raii Syn.* 2. 148.
1340 Primula veris flore rubro. *Ger.*
1341 Pſeudo-acacia. *T.* 649.
1342 Rapiſtrum maximum Cornuti. 147.
1343 Reſeda foliis inferioribus integris, ſuperioribus laciniatis.
1344 Sambucus folio laciniato. *C. B.* 456.
1345 Sambucus humilis, ſive *Ebulus.* ib. *Off.* 180.
1346 Scutellaria foliis cordato-lanceolatis, ſerratis, pedunculis multifloris.
1347 Sherardia *Dillenii. Cat. Giſſ.* p. 96.
1348 Sonchus maritimus anguſtifolius. *C. B. P.*
1349 Trigonella leguminibus pedunculatis congeſtis, *&c. Hort. Upſal.*
1350 Viola Martia arboreſcens purpurea. *C. B.* 199.

XVIII.

XVIII. *An Account of a ſurpriſing Inundation in the Valley of* St. John's *near* Keſwick *in* Cumberland, *on the* 22d *Day of* Auguſt 1749, *in a Letter from a young Clergyman to his Friend; communicated by* John Lock, *Eſq*; *F. R. S.*

Feb. 12. 1749.

SIR,

Read March 15. 1749. IN order to give you a diſtinct Anſwer to your Queries in relation to the Inundation at *St. John's*, I took a Ride to the Place to ſatisfy myſelf of the Matter of Fact, becauſe the Accounts which were given me were very different.

This remarkable Fall of Water happened at 9 o'Clock in the Evening, on the 22d of *Auguſt* laſt, in the Midſt of the moſt terrible Thunder, and inceſſant Lightning, ever known in that Part in the Memory of the oldeſt Man living, the preceding Afternoon having been extreme hot and ſultry. And what ſeems very uncommon, and difficult to account for, the Inhabitants of the Vale, of good Credit, affirm to have heard a ſtrange buzzing Noiſe like that of a Malt-mill, or the Sound of Wind in the Tops of Trees, for two Hours together, before the Clouds broke.

I am not ſo much a Philoſopher as to find out what could occaſion ſuch a vaſt Collection of Clouds or Vapours, particularly at that Time and Place; but am ſatisfy'd from the Havock it has made in ſo ſhort a time (for it was all over in leſs than two Hours), that

that it muſt have far exceeded any Thunder-ſhower that we have ever ſeen. Moſt probably it was a Spout or large Body of Water, which, by the Rarefaction of the Air, occaſioned by that inceſſant Lightning, broke all at once upon the Tops of theſe Mountains, and ſo came down in a Sheet of Water upon the Valley below.

This little *Valley of St. John's* lies Eaſt and Weſt, extending about three Miles in Length, and half a Mile broad, cloſed in on the South and North Sides, with prodigious high, ſteep, rocky Mountains: Thoſe on the North Side, called *Legburthet Fells*, had almoſt the Whole of this Cataract; for I do not find that any remarkable Quantity of Water was obſerved from thoſe on the South, notwithſtanding the Diſtance from the Tops on each Side cannot be a Mile. It appears likewiſe, that this vaſt Spout did not extend above a Mile in Length; for it had Effect only upon four ſmall Brooks, which come trickling down from the Sides of the rocky Mountains. But no Perſon, that does not ſee it, can form any Idea of the ruinous Work occaſioned by theſe Rivulets at that time, and (what ſeems almoſt incredible) in the Space of an Hour and half. At the Bottom of *Catcheety Gill*, which is the Name of the greateſt, ſtood a Mill and a Kiln, which were entirely ſwept away, in five Minutes time, and the Place where they formerly ſtood, now covered with huge Rocks, and Rubbiſh, 3 or 4 Yards deep. One of the Mill-ſtones cannot be found, being covered, as is ſuppoſed, in the Bottom of this Heap of Rubbiſh.

In the Violence of the Storm, the Mountain has tumbled ſo faſt down as to choak up the old Courſe

of

of this Brook; and, what is very ſurpriſing, it has forced its Way through a ſhivery Rock, where it now runs in a great Chaſm, four Yards wide, and betwixt eight and nine deep.

In the Courſe of each of theſe Brooks, ſuch monſtrous Stones, or rather Rocks, and ſuch vaſt Quantities of Gravel and Sand, are thrown upon their little Meadow-fields, as render the ſame abſolutely uſeleſs, and never to be recovered.

It would ſurpaſs all Credit to give the Dimenſions and Weight of ſome Rocks, which are not only tumbled down the ſteep Parts of the Mountains, but carried a conſiderable Way into the Fields, ſeveral thrown upon the Banks larger than a Team of ten Horſes could move. Near a Place called *Lobwath*, I had the Curioſity to meaſure one carried a great Way, which was 676 Inches, or near 19 Yards about.

The Damage done to the Grounds, Houſes, Walls, Fences, Highways, with the Loſs of the Corn and Hay then upon the Ground, is computed variouſly, by ſome at 1000*l.* by others at 1500*l.*

One of theſe Brooks, which is called *Moſe or Moſedale Beck*, which riſes near the Source of the others, but runs North from the other Side of *Legburthet Fells*, continues ſtill to be foul and muddy, having, as is ſuppoſed, worn its Chanel ſo deep in ſome Part of its Courſe as to work upon ſome mineral Subſtance, which gives it the Colour of Water huſhed from Lead-mines, and is ſo ſtrong as to tinge the *River Derwent* (into which it empties itſelf) even at the *Sea*, near 20 Miles from their Meeting.

Theſe

Theſe are moſt of the Particulars I could collect concerning this wonderful Inundation. I ſhall only add *Mr. N.'s Philoſophical Account to his philoſophical Friend.*

SIR,

" *Tueſday Auguſt* 22. 1749. was the beſt Hay-day " we had here that Seaſon, but at Eight o'Clock " at Night it began to Thunder, firſt Weſtwards " from *Cockermouth*, then in a few Minutes Eaſt- " wards from *Penrith*. Theſe Thunder-clouds, " with equal Force, and contrary Direction, met " together upon the Mountains above the Valleys " of *St. Johns* and *Threlkeld*, as at or about the " *Great Dod* and *Cova Pike*, and muſt of conſe- " quence hover on or about them, and thereon " vent *Water-ſpouts* (but not ſo on the Valleys, " otherwiſe than by the violent Courſe of the " Brooks and Rivulets, from the one down to the " other); which would increaſe and perpetuate the " Lightning, ſo ſwift in Motion, and viſible to our " Eyes, but retard and obſtruct the Undulations of " the Air, which are far more ſlow in Motion, and " later in coming to our Ears.---For any two ſuch " Bodies as thick Clouds, driven by contrary Winds, " and meeting together with equal Force, and con- " trary Directions, cannot impel each other back- " wards or forwards, but muſt remain at or about " the Place where they met, and there exert their " Vigour: which, in this Caſe, muſt be the Reaſon " of ſuch Water-ſpouts upon theſe Mountains, and " not in the Valleys; and alſo why the Sight of

" the Lightning was more terrible to our Eyes than " the Sound of the Thunder to our Ears.---Like to " this is the Caſe of *Whirl-puffs*."

Yours, &c.

J. R.

XIX. *An Account of an extraordinary Fire-ball burſting at Sea, communicated by* Mr. Chalmers.

Read March 22. 1749. *November* 4. 1749. in the Latitude of 42° 48′ Longitude, 09° 03′ the Lizard then bore, N. 41° 05′ about the Diſtance of 569 Miles. I was taking an Obſervation on the Quarter-deck, about ten Minutes before 12 o'Clock: One of the Quarter-maſters deſired I would look to Windward, which I did, and obſerved a large Ball of blue Fire rolling on the Surface of the Water, at about Three Miles Diſtance from us: We immediately lowered our Topſails, and had our Fore and Main Clew-Garnets manned to haul up our Courſes; but it came down upon us ſo faſt, that before we could raiſe the Main Tack, we obſerved the Ball to riſe almoſt perpendicular, and not above forty or fifty Yards from the Main Chains: It went off with an Exploſion as if Hundreds of Cannon had been fired at one time; and left ſo great a Smell of Brimſtone, that the Ship ſeemed to be nothing but Sulphur. After the Noiſe was over, which I believe did

did not laſt longer than half a Second; we looked over head, and found our Maintopmaſt ſhattered into above an hundred Pieces, and the Mainmaſt rent quite down to the Heel. There were ſome of the Spikes, that nail the Fiſh of the Mainmaſt, drawn with ſuch Force out of the Maſt, that they ſtuck in the Main Deck ſo faſt, that the Carpenter was obliged to take an Iron Crow to get them out: There were five Men knocked down, and one of them greatly burnt, by the Exploſion. We believe, that when the Ball, which appeared to us to be of the Bigneſs of a large Millſtone, roſe, it took the Middle of the Main Topmaſt, as the Head of the Maſt above the Hounds was not ſplintered: We had a very hard Gale of Wind, from the N. by W. to the N. N. E. for two Days before the Accident, with a great deal of Rain and Hail, and a large Sea: From the Northward we had no Thunder nor Lightning, before nor after the Exploſion. The Ball came down from the N. E. and went to the S. W.

This Account was given by Mr. *Chalmers*, who was, when the above-mentioned Accident happened, on board his Majeſty's Ship the *Montague*, under the Command of Admiral *Chambers*.

XX. *Extract of a Letter from the Abbé* Nollet, *F.R.S.* &c. *to* Charles *Duke of* Richmond, *F. R. S. accompanying an Examination of certain* Phænomena *in* Electricity, *publiſhed in* Italy, *by the ſame, and tranſlated from the* French *by Mr.* Watſon, *F. R. S.*

Paris, March 5. 1750.

May it pleaſe your Grace,

Read March 29. 1750. IF your Grace ſhall have done me the Honour to have peruſed the Treatiſe I ſent, intituled, *Recherches ſur les Cauſes particulieres des Phenomenes electriques*, your Grace will have ſeen my Doubts touching the Reality of certain Facts publiſhed in *Italy*, and which have not ſucceeded any-where elſe. I will not diſſemble, that the Deſire of knowing how far theſe Things were true, has been one of the principal Motives of my Journey; and if your Grace has been deſirous to have learned the Fruits of my Inquiries in this reſpect, you need only look over the Memoir ſent herewith, which I beg your Grace afterwards to preſent to the Royal Society. I well know how much that learned Body intereſts itſelf in relation to the Subject of this Memoir; and, as one of its Members, I think it my Duty to communicate the Reſult of my Labours. As I correſpond with Mr. *Watſon*, who is well verſed in theſe Matters, it may not be diſagreeable to him to put theſe Papers in a Condition to be laid before the Royal Society. I have

have made the whole Tour of *Italy*, which has enabled me to make many Obſervations relating to Natural Philoſophy. I have made ſome Experiments at the *Grotto del Cani*, near *Naples*, which take off a good deal, in my Opinion, of the Marvellous of that famous Phænomenon. I propoſe to myſelf the Honour of tranſmitting them upon ſome future Occaſion, as my Letter is already too long. The Eructations from *Veſuvius* were very great when I was there, and were the Prelude to three Earthquakes, which happened juſt after my Departure, and which I was fortunate enough not to be Witneſs of. The *Lagunes* of *Venice*, and the Waters of the *Mediterranean* Sea, appear luminous every-where in Summer, in dark Nights: I have diſcovered, that this Light proceeds from a very ſmall Inſect, which multiplies prodigiouſly. I have heard all my Life, that the Water of the Ocean appears ſometimes luminous: It may poſſibly proceed from the ſame Cauſe, and I ſhould be very glad of a particular Inquiry into this Fact. I have the Honour to be, with the moſt inviolable Attachment,

My Lord Duke,

Your Grace's

Moſt humble and obedient Servant,

The Abbé NOLLET.

An

An Examination of certain Phænomena *in* Electricity, *publiſhed in* Italy, *by the Abbé* Nollet, *Fellow of the Royal Society, of the Royal Academy of Sciences at* Paris, *and of the Academy* del Inſtituto *at* Bologna, *communicated to the Royal Society by his Grace* Charles *Duke of* Richmond, *&c. F. R. S. Tranſlated from the* French *by* W. Watſon, *F. R. S.*

ELectricity, after having excited every-where the Emulation of the Ingenious, after having filled us with Wonder by an infinite Number of Phænomena more ſingular and more admirable one than another, ſeems, within theſe few Years, to have ſhewn itſelf equally ſurpriſing, but more uſeful, in *Italy*, than it had done in *England*, *France*, *Germany*, &c. where, for theſe twenty or five-and-twenty Years, ſo great a Progreſs had been made. We have heard of nothing leſs than the Cure, or the almoſt ſudden Relief, of Diſtempers of every Kind, and of purging all Sorts of Perſons in a manner of all others the moſt proper to avoid the Repugnance and Diſguſt we naturally have to medical Potions. Even that Diſeaſe which we are moſt deſirous of concealing, was not by theſe means without its Remedy; the Mercury being volatilized, and carried, by the electric Matter, into the Body of the Patient, tinged his Skin of a leaden Colour, and procured him a certain Cure by a copious Salivation.

The Manner in which this was done was not leſs to be wondered at than the thing itſelf; Perſons afflicted with inveterate Gouts, Rheumatiſms, Fluxions, Tumours, *&c.* were relieved therefrom

by being electrized for a few Hours, and often a leſs Time was ſufficient. Sometimes the rubbing a Glaſs Tube only, or at other times a Glaſs Tube lined with ſome Medicine appropriated to the Diſeaſe of the Patient, was employed. Theſe Medicines, to exert their Operation upon the Patient, paſſed thro' the Glaſs; and this they were very certain of, as they ſaw them ſenſibly diminiſh in their Quantity, although the Glaſs containing them was ſtopped as cloſe as though ſealed hermetically. To promote Stools, it is only neceſſary that a Perſon ſhould be electrized for ſix or eight Minutes, holding in his Hand a Piece of Scammony or Gamboge; the Effects were as certain, as though theſe Drugs were taken internally. Beſides, if a Perſon was deſirous of being perfumed from Head to Foot, nothing more was neceſſary than being electrized with a Glaſs Veſſel lined with Balſam of *Peru*, *Benjamin*, or ſome ſuch Drug; and from this Electrization the Odours were perceptible for two or three Days, even ſo much as to incommode thoſe to whom theſe Smells were diſagreeable.

Effects no leſs wonderful than theſe were publiſhed every Day, by Writings printed, and printed again *, or

* The firſt of theſe Works is a Letter of M. *Pivati*, an Advocate at *Venice*. It was firſt printed at *Lucca* in 1747. and ſome time after reprinted at *Venice*, always with the ſame Title, *Della Elettricita, Lettra del chariſſimo Signor Franciſco Pivati*, &c. This Letter was tranſlated into *French*, and printed at *Paris*. In 1748. there appeared another Treatiſe, printed at *Bologna*, intituled, *Oſſervationi fiſico-mediche intorno alla Electricita, da Gio. Giuſeppe Verati publ. profeſſ. nella univerſita e nella Academia delle Scienze del inſtituto academico Benedettino*. In the ſame Year 1748. there was printed at *Verona* a little

or by particular Letters and Memoirs in Manuſcript addreſſed to the Ingenious all over *Europe*. They were alſo confirmed by reſpectable Witneſſes, and by ſuch as were capable of impoſing them upon Perſons the moſt guarded againſt the Exaggerations, which never fail accompanying the Relations of intereſting Novelties.

The Importance of the Facts themſelves, and the Appearance of Authenticity which attended them, demanded that they ſhould be conſidered; and indeed they rouſed every-where the Attention of thoſe Philoſophers, who had for any time turned their Thoughts to theſe Enquiries. Every one of them was deſirous of repeating what Mr. *Pivati* ſaid had been done at *Venice*, Mr. *Verati* at *Bologna*, and Mr. *Bianchi* at *Turin*; and to begin them, as the Experiment ſeemed more ſimple, they attempted at firſt the Tranſmiſſion of odoriferous Subſtances through the Pores of the Glaſs, the firſt Foundation of *Intonacatores* †, ſo called by Mr. *Pivati*; and which we ſhall, in the Progreſs of this Paper, call medicated Glaſſes; and they

---

little Treatiſe concerning medical Electricity, intituled, *Lettra del Signiore Canonico Brigoli ſopra la Machina Elettrica*. Afterwards, in 1749. there was publiſhed at *Venice* a new Treatiſe, conſiderably larger than the firſt, in which we find not only the Author's own Experiments, but alſo thoſe of Mr. *Bianchi* of *Turin*, and of ſome other Perſons who had taken Pains with this View. This laſt Work is intituled, *Refleſſioni fiſice ſopra la Medicina Elettrica*. It is principally in this Volume that the Facts of which we are now treating are mentioned.

† Mr. *Pivati* has given this Name to the manner in which he prepares hollow Cylinders of Glaſs in filling them, or lining them, with ſome Drug, the Virtue of which, he pretends, will tranſude with the electric Matter.

they endeavoured to purge Perſons of all Ages, and of both Sexes, by making them hold in their Hand, while they were electrized, Scammony, Gamboge, Aloes, and ſuch-like. But it was very extrordinary, that of all the Perſons who were engaged in theſe Experiments, no one could ſucceed; and, from a ſort of Shame, each of them expected, that ſome one would complain of his Want of Succeſs: But this was retarded, as yet, by the Haſte with which Mr. *Winkler* * ſent to the Royal Society, and to ſome ingenious Men in *France*, the Reſult of his own Experiments, which well agreed with thoſe of *Italy*, and upon the Credit of which he had made them.

For my own Part, I will ſpeak without any Reſtraint: When I found my Attempts were fruitleſs, I without any Difficulty communicated it to all the Philoſophers with whom I correſponded: I deſired them to let me know if they had been more ſucceſsful than my myſelf, and to acquaint me how they had proceeded, that I might conform myſelf thereby. I was much more willing to confeſs my Inability, and to learn from others the Method which muſt of Neceſſity be obſerved, than to be deprived longer from ſeeing thoſe Phænomena which ought to reſult therefrom. Inſtead of Inſtructions, which might conduct me to the Succeſs I wanted, I received nothing but ſuch Confeſſions as mine: From theſe I ſaw, that all Methods had been tried; and that nothing remained to be done, but either to believe every thing upon the Faith of others, or to doubt, without Hopes

* A celebrated Profeſſor of Philoſophy at *Leipſick*, who has written a good deal concerning Electricity.

Hopes of being better informed. The firſt of theſe two Caſes was directly oppoſite to the Law I had determined to abide by, when I firſt engaged in the Study of experimental Philoſophy; and the other was putting a great Violence upon myſelf. But from this Moment I formed my Project of travelling; and, among the different Motives which made me undertake the Journey to *Italy*, I muſt confeſs one of the moſt preſſing was, the Deſire of ſeeing ſucceed, in the Hands of thoſe who had ſaid they had, thoſe Phænomena in Electricity, towards the Verification of which I had made ſo many fruitleſs Efforts. I formed to myſelf a great Pleaſure in ſeeing Balſam of *Peru*, *Benjamin*, *Camphire*, *Cinnamon*, *&c.* pervade an electrized Glaſs, which I had taken care to ſtop myſelf; to ſee People purged by the Palm of their Hands; to ſee an old gouty Man, as the Biſhop of *Sebenico* *, clap his Hands together, ſtrike the Ground with his Feet, and walk freely, after an Electrization of two Minutes: But what ſtill more piqued my Curioſity was, to learn, if poſſible, why the *Italian* Electricity ſhould enjoy theſe Prerogatives, to the Excluſion of that of every other Country. If this Singularity was as real as it appeared to be, it was a new Wonder more difficult to be explained than any other; and of which I propoſed to ſtudy attentively the Circumſtances, to endeavour to find out the Cauſe.

If I have had the Trouble of paſſing the *Alps*, to ſearch out the Truth, it is neither to conceal it, nor yet leſs to diſfigure it with Falſhood; and I will re-

* See Mr. *Pivati's* Letter, printed at *Lucca*, p. 37.

late,

late, with a Liberty truly philoſophical, all th at have heard, and all that I have ſeen: But if, in doing this, I ſhall find myſelf obliged to contradict ſome of the Facts publiſhed by ſome Perſons known in the Republic of Letters, I proteſt that it is without Prejudice, on my Part, to the advantageous Idea I may have of their Candour or Abilities; and I ſincerely wiſh, that the Reader may conſider them in the ſame manner. If he is judicious, he will willingly concur with me; becauſe, in an Enquiry ſo obſcure as this of which we are now treating, an ingenious Man, with a very juſt Intention, may take what is falſe for that which is true.

I arrived at *Turin* about the Beginning of *May* 1749. and one of my firſt Cares was, to viſit Mr. *Bianchi*, a celebrated Anatomiſt, and the firſt Author of purging by Electricity. I related to him all that he had written to me upon this Subject; and I begged of him, that all the Experiments, which had neither ſucceeded with me, nor a great many others, might be repeated between us, and under his Direction. His Complaiſance eaſily granted what I deſired: We ſet about it; and Pere *Garo*, a *Minim*, and Profeſſor of Philoſophy in the Univerſity, cauſed to be carried to the Place where we determined to make our Experiments his electrifying Machine; which is exactly like that which I have deſcribed in my Eſſay, *Page* 19. *Fig.* 2.

The Experiments of the Firſt Day.

Upon the 21ſt of *May*, about Four o' Clock in the Afternoon, the Weather cool, but uncertain, Mr. *Bianchi* having procured a Lump of Scammony, and

another of Gamboge, each of which was about the Size of an Hen's Egg; I took the former in my Right-hand, and having applied my Left near the Surface of the Glaſs Globe, and ſtanding upon a Cake of Reſin, I was electrized fifteen Minutes without Interruption. This Day the Electricity was indifferntly ſtrong.

After me, a young Man, aged Twenty-two, and of a pale Complexion, was electrized; whom, a few Days before, I had taken into my Service.

They then electrized a young Woman of about Sixteen or Seventeen, of a weakly Conſtitutioh; but who, at that time, was tolerably well.

After that M. *Beccari*, Profeſſor of Philoſophy in the Univerſity, aged about Thirty-five, of a dry Habit, was electrized.

They then electrized a Servant belonging to the Houſe where they made the Experiments, aged about Twenty-four, who did not appear to be indiſpoſed.

They alſo made the ſame Experiment upon another Servant, a ſtrong Man of Forty, or thereabouts; and each of theſe Perſons was electrized the ſame time as I had been; that is, fifteen Minutes ſucceſſively.

I did not perceive in myſelf any Effect, which I could attribute to the Electricity; no extraordinary Motion or Pain in my Bowels; and it was the ſame with M. *Beccari*, with the Servant aged Forty, and with the young Woman.

But the young Man of Twenty-two, being interrogated after the others, ſaid, that he had had in the Night two Stools, and ſome Complaints of the Colic. The Servant of the Houſe, who was asked the ſame Queſtions, declared, that he had had a very large Stool, as though he had taken a Purge.

Theſe

Theſe two laſt Depoſitions were, as the others, taken upon the Spot; and I began to conſider them as important, when I learned, from the Confeſſion of the laſt, that he had taken, for ſome Days, a Decoction of wild Succory, for an Indiſpoſition which he had not ſpoke of till then. The young Man who ſaid he had had two Stools, rendered his Teſtimony more than ſuſpicious, by certain Singularities * which he was deſirous of adding ſome Hours after; and ſince that time he has conducted himſelf in ſuch a manner, as to prevent my having any Confidence upon what he ſaid.

What I have juſt now mentioned to have found in theſe two Servants, one of which kept me ignorant ſome time of his having taken Broth with Succory; and the other having teſtified ſuch a Love for the Marvellous, that one ought in Prudence to ſuſpect every thing he ſaid; This, I ſay, made me very delicate in the Choice of the Perſons who I was deſirous ſhould be admitted to our Experiments. I declared that I was not willing to receive thereto either Children, Servants, or People of the lower Claſs; but only that reaſonable People ſhould be admitted, and of an Age ſufficient to leave nothing to be feared of the Truth of what they might depoſe.

The

---

* This young Man made himſelf very happy in relating to every body, that he had been electrized; and that he had been purged thereby, as though he had taken Phyſic: And added, that, an Hour after his Electrization, having had the Curioſity of viſiting his Wife, to ſee what would be the Conſequence, he had communicated this lectricity to her, and that ſhe had been purged as well as himſelf.

The Second Experiment.

The Day after we had made our firſt Set of Experiments I was again electrized fifteen Minutes ſucceſſively, as I had been the Day before, holding in my Hand a large Piece of Scammony; and after me there went ſucceſſively through the ſame Trial Dr. *Scherra* a Phyſician, Mr. *Verne* Demonſtrator of Anatomy, the Marquis of *Sirié*, the Abbé *Porta* a Profeſſor in the Univerſity, the Preceptor to the Children of the Marquis *D'Ormea*, and the Preceptor to the young Meſſieurs *D'Oſa*. This Day the Electricity was indifferently ſtrong.

Of all theſe Perſons who were electrized, not one felt any Pains in his Belly, no one had any Evacuation which could be attributed to the electrical Power; but to ſay ſcrupulouſly all that came to my Knowledge, after ſeveral Queſtions, the Preceptor to young Meſſieurs *D'Ormea* declared, that he had parted with more Wind than he had uſually done, and he believed alſo with more Urine. Thus of ſeven Perſons there was but one who ſuſpected the Operation of Electricity to have had any ſenſible Effect upon him, and this Suſpicion, as we ſee, was a very ſlight one.

The Third Experiment.

The 23d of *May*, the Electricity being more ſtrong than the preceding Days, we choſe a Piece of new * Scammony, very ſtrong in its Flavour, and which

* M. *Bianchi* ſuſpected, that the Drugs we had made uſe of in our firſt Experiments had left their moſt ſubtile Parts, only capable, as he ſaid, of being introduced with the electric Matter.

which weighed four Ounces: The Marquis *D'Ormea*, Dr. *Allion*, a Phyſician, the two above mentioned Preceptors, Pere *Garo*, Count *Ferrero*, and myſelf, held, one after the other, this Piece of Scammony, and each was electrized fifteen Minutes, as had been done in the former Expetiments.

Two Days paſſed, and abſolutely none of theſe Perſons perceived any thing, that could be attributed to the Electricity.

The Fourth Experiment.

The ſame Day we endeavoured to repeat an Experiment, which M. *Bianchi* had wrote me word of ſome Months before, and which had not ſucceeded with me at *Paris*. This Experiment was the Tranſmiſſion of Odours along a Chain, or an iron Bar electrized. One of us prepared and applied a little Piece of Linen, covered with Balſam of *Peru*, upon the iron Bar, which received the Electricity from the Globe: We faſtened to this Rod the End of an iron Chain, which was electrized by Communication; and we expected, that the Odour of the Balſam would be tranſmitted to the other End of the Chain, to which was hung a Ball of Metal. But this was expected in vain; nobody could perceive the ſlighteſt Sign of this Tranſmiſſion.

M. *Bianchi*, ſeeing, as I did, that the Reſult of all theſe Experiments did not agree with thoſe, which he had believed to have taken place before, told me, that this Difference might ariſe from our having employed an Electricity too ſtrong: becauſe that which he had experienced with Succeſs had always appeared more weak. I ſubmitted to this Reaſon,

Reaſon, having no other to give him more plauſible; and to bring the whole Operation, as near as might be, to its firſt Circumſtances, we met together, to the Number of fourteen, at M. *Bianchi's*, where we were expected; and we were electrized, one after the other, by him, as long a time as he judged proper, ſometimes with Scammony, and ſometimes with Gamboge, which he himſelf had choſen.

The Machine uſed this Day was the ſame, with which M. *Bianchi* had always made his own Experiments. It conſiſted of an hollow Glaſs Cylinder, three Inches in Diameter, and ſomething more than half a Foot in Length *, mounted between two Supporters upon a Board, which was faſtened to a Table with Screws. This cylindrical Veſſel was turned round, without any other intermediate Apparatus, by an Handle, which was at leaſt four Inches in its Radius; ſo that the Hand, by which this Machine was turned, revolved with greater Velocity than the Surface of the Glaſs Cylinder, which was thereby put in Motion.

This Machine had this Convenience, that one Perſon only might turn the Handle with one Hand, and rub the Surface of the Glaſs Veſſel with his other: But there is no Difficulty in comprehending, that the Electricity could not but be always very weak with ſuch a Cylinder, and from ſuch Friction; ſo that, in the Experiments of this Day, we were ſcarce able to perceive any Snaps, in touching the iron Chain, by which the Electricity was com-

* The Author here means the *French* Foot.

communicated, or from the Perſon electrized ; but this was preciſely what was deſired.

Theſe Experiments were made on *Thurſday*, *May* 29, between Four and Six o'Clock in the Afternoon, in a very hot and ſerene Day : on *Sunday* Evening, all the Perſons who had been electrized, being interrogated, anſwered without Heſitation, and in a manner abſolute in all reſpects, that they had perceived nothing which could be attributed to theſe Experiments : theſe Perſons were the Marquis *de Siria*, Count *Ferrero*, the Marquis *D'Ormea*, Monſieur *de Tignola*, an Officer of Artillery, Pere *Beccari*, Pere *Garo*, Dr. *Allion*, Monſieur *Verne*, Dr. *Scherra*, the Abbé *Porta*, the two Preceptors, the young Woman, whom I mentioned before, and myſelf.

The Night following, that is to ſay, that between *Sunday* and *Monday*, I was troubled with an Indigeſtion, and felt Pains of the Colic ; but I attributed them much leſs to the being electrized the preceding *Thurſday*, than to ſome Roots I had eaten the Day before at Dinner, and to a very large Glaſs of iced Lemonade, which I had drank ſome time after, and contrary to my uſual Cuſtom. Nevertheleſs, as ſome Perſons were deſirous of ſaying, that the electrizing had purged me, and that I had not the Candour to ſpeak of it, I thought it my Duty to add here for my Juſtification, that during my whole Life I have had a weak Stomach ; that I could never take Ice, nor Liquors very cold, without a good deal of Circumſpection, and always at the Hazard of being incommoded therefrom ; and that theſe Roots, which are called *Ravanelle* in

Piedmont, notwithſtanding my Attention to eat ſparingly of them, had oftentimes diſturbed my Digeſtion, during my Stay there, and at times when I had no Concern in electrical Experiments. Beſides, the not being incommoded for three Days, and more, was ſufficient to prevent my attributing what happened to me to the electrical Power.

The extreme Circumſpection, with which I was deſirous of chooſing the Perſons for all our Experiments; the Difficulty of procuring and moving ſuch ſick People, who were in a Condition and Diſpoſition to leave nothing to be feared on their Parts from their Prejudice, and their heated Imagination; that of reconciling my Time with that, which a Phyſician of great Practice could grant me; theſe Obſtacles, I ſay, prevented my attempting with M. *Bianchi* ſuch Cures, as he believed to have been brought about by means of the electric Virtue, either by its own Action, or by joining thereto Medicines appropriated to the Condition of the Sick, and contained in Glaſs Veſſels electrized by Friction. But I teſtified a great Deſire of ſeeing thoſe Perſons who had been cured, or conſiderably relieved, by this Method before this time. I asked, for this Purpoſe, the Gentlemen of the Profeſſion, who had been Witneſſes of the Experiments, and who were yet in a Condition of ſeeing every Day ſome of the Perſons, cited in a Manuſcript which I had of M. *Bianchi*'s; and of whom the exact Hiſtory is mentioned in the ninth Chapter of a Treatiſe of M. *Pivati* *: I went myſelf to the Shoemaker, in whoſe

* *Reffleſſioni fiſichè ſopra la Medicina elettrica*, p. 149.

whoſe Shop the young Man of twenty-one Years of Age worked, mentioned in the 110th Page of the above Treatiſe, and in Page 419 of my *Recherches* *. The Obligation of ſaying the Truth, to which Philoſophers ought to ſacrifice every human Regard, will not permit me to diſſemble that my Enquiries made with all poſſible Diligence, and without any other Intereſt than that of knowing the Truth, have made me ſee ſufficiently clear, that theſe Facts have been greatly exaggerated. I am willing to believe, that it is the Fault of the Sick, who, being prejudiced perhaps by too great Hope, and poſſeſſed by a kind of Enthuſiaſm, have ſaid themſelves, and made others believe, more than really was the Caſe. One might have Examples enough to cite of ſuch Illuſions; but be that as it will, I cannot help believing, that a great Part of the electrical Cures of *Turin* have been no other than temporary Shadows, which have been taken with a little too much Precipitation, or Complaiſance, for Realities.

I carried with me to *Venice* the ſame Curioſity, and the ſame Deſire of being inſtructed, upon the Subject of the Tranſmiſſion of Odours from medicated Tubes, and of the Cures, or of being relieved from Diſorders almoſt ſuddenly, by the electrical Power. One of my firſt Cares was, to find out ſome Friends or Acquaintance of M. *Pivati* to acquaint him of my Arrival, and to obtain of him the Favour of being admitted into his Laboratory; and

* They have tranſlated *Hatter*, inſtead of *Shoemaker*, in taking the *Italian* Word *Calcetario* for that of *Calzolaio*, which was ſufficiently legible in the Manuſcript.

and that he would have the Complaiſance to ſatisfy my great Deſire of ſeeing him cauſe Odours to pervade the Sides of a well ſtopped Glaſs, or by electrifying to diminiſh ſenſibly any Subſtance therein contained. Mr. *Angelo Quirini*, a *Venetian* Gentleman, a great Friend to the Sciences, and one always ready to aſſiſt thoſe who apply themſelves thereto, did me this Service among many others, for which I am indebted to his Friendſhip and Politeneſs. He accordingly acquainted M. *Pivati*; and on the 1ſt of *Auguſt*, 1749. we waited upon him, and found there a large Company, among which were ſeveral Perſons of Diſtinction: Among others were Mr. *Antony Moſſinigo*, heretofore Embaſſor in *France*, Abbé *Horter*, &c. At the Sight of this great Aſſembly I believed (and I had ſome Reaſons for believing it) that my Curioſity had been * ſuſpected of Disbelief, and of an Obſtinacy to doubt; this Company therefore was called together to be an Evidence of my Conviction. I would have been willing to have bought at this Price the Pleaſure of ſeeing a Phænomenon, for the verifying of which I had taken ſo much fruitleſs Trouble. The manner of making it ſucceed had been without doubt ſome Novelty to me, as curious itſelf as the Effect which ſhould have reſulted therefrom. But how great were my Surprize, and my Regret, when M. *Pivati* declared

* I had been acquainted, that my Arrival at *Venice* had been notified by Letters from *Turin*, which had deſcribed me as a Man ſo prejudiced againſt Facts, that the ſtrongeſt could not make me believe. In this they did me great Injuſtice; unleſs they took for Incredulity on my Part the Precaution I took, againſt Illuſion, and falſe Appearances.

declared frankly to me, in the Preſence of this whole Company, that he would not attempt to ſhew me the Tranſmiſſion of Odours; that that Phænomenon had not ſucceeded but once or twice, as he had ſaid in his firſt Letter printed at *Lucca*, although ſince that he had made many Attempts to repeat that Experiment, with the ſame as well as with other Glaſſes; that this Cylinder had been ſince broke; and that he had not ſo much as kept the Fragments of it!

But at leaſt, I told him, I might ſee him uſe one of his medicated Tubes, and weigh it before and after electrifying, to ſee, with him, the included Matter diminiſh ſenſibly. This Fact, he told me, had ſucceeded with him a great many times; but that now there was too much Company; that it was too hot, and, in conſequence, that the Electricity would be too weak for it. He might perhaps be in the Right: But why did he call together ſo numerous a Company?

I then asked him concerning the Cures related in his Works, and eſpecially concerning that of the Biſhop of *Sebenico* *. He avowed to me (and in Part I knew it already), that the Prelate was not cured; and that, ſince the Electrification, he had been as he was before.

I took my Leave of M. *Pivati*, and acquainted him, that I propoſed to continue about a Week in *Venice*; and I very earneſtly begged of him to collect together his beſt Veſſels, to renew the Subſtances therein, and to let me know, that, if they ſucceeded, I might wait upon him, that I might be able to publiſh

* See Page 374. *ſuprà.*

liſh them as an Eye-witneſs; and I ſpoke to him with a good deal of Sincerity. M. *Pivati* promiſed me he would; but, as I heard nothing from him afterwards, I preſume that he had nothing to ſhew me.

Dr. *Sommis*, of the Faculty of Phyſic at *Turin*, being at *Venice* a little while after me, had alſo the Curioſity of viſiting M. *Pivati* in *Auguſt* laſt, and to ſee, under his Management, the Effects attributed to the medicated Tubes. The following is the Letter* he wrote me upon this Subject, *Nov.* 15. 1749.

" Here is, kind Sir, in a few Words, the Ac-
" count of what I obſerved in *Venice*, at Signor
" *Pivati's*, during the Month of *Auguſt* laſt. The
" 25th Day, after Dinner, he electrified me, make-
" ing uſe of a Tube of the Length of about five
" Inches, and a little more than two in Diameter,
" cauſing me to hold in my Hand an Ounce of
" Scammony. There were preſent at this Experi-
" ment his Excellency the Abbate *Barbarigo*, the
" Fathers *Bertinelli* and *Magrini*, Jeſuits, Dr. *Gram-*
" *pini*, and ſeveral other Perſons. I found not any
" Change in myſelf either that Evening or the fol-
" lowing Day. The 29th of the ſame Month I
" returned again to Signor *Pivati*, where I found a
" Gentleman of the Houſe of *Soranzo*, two *Spaniſh*
" Officers, two other *Venetian* Gentlemen, a Phy-
" ſician, and ſome others; and he cauſed a Tube to
" be lined [or plaiſtered within] for the Experiment,
" which was repreſented by him in a dangerous
" Light; but which was not ſuch however as to hinder
" my telling him, that I deſired that the Experiment
" might

* This Letter is tranſlated from the *Italian*.

" might be made npon myſelf. He began then to
" electrize me at 35 Minutes after Five in the After-
" noon, and made an end, becauſe the Line of the
" Wheel tangled, at 57 Minutes after Five. Having
" then new-fitted the Line, he began again at five
" Minutes after Six, and continued till 14 Minutes
" after, making again this time the Sparks to iſſue con-
" tinually from my Forehead. This Tube was nearly
" of the ſame Length and Size as the former. The Ex-
" periment being over, I then prayed him to tell with
" what Materials the Tube had been lined; and ſo
" much the rather, as he had let fall in Diſcourſe with
" the *Spaniſh* Gentleman, that they might have ſeen
" me ſleep; and he anſwered me, that the Tube was
" lined with two Ounces and ſix Drams of Flowers of
" *Benjamin*, and two Drams of *Opium*. Having heard
" him mention the *Opium*, I prayed him to take
" the Trouble of making another Experiment, his
" Excellency Signior Abbate *Pietro Barbarigo*, and
" myſelf alſo, having with us an Ounce and Half of
" *Opium*; and he complied with my Deſire. He
" therefore electrified his Excellency, making him
" hold the *Opium*, that is to ſay, the Quantity of
" half an Ounce of it, in his Hand, and the Sparks
" iſſuing from his Hand for half an Hour toge-
" ther, beginning at 18 Minutes, and finiſhing at 48
" Minutes, after Six. In this ſecond Experiment he
" made uſe of the ſame Tube which he had uſed the
" *Monday* before, the 25th of the ſame Month: But
" neither his Excellency nor I ſlept more than ordi-
" nary. Theſe are the Experiments which I made
" at *Venice* with Signor *Pivati*. In my Return
" home, paſſing thro' *Placentia*, I here ſpoke with

Dr.

" Dr. *Cornelius*, who aſſured me, in Preſence of " Dr. *Riviera*, that he alſo had tried a great many " times to purge others by electrifying them; but " that it had never ſucceeded with him but once, " which was upon a Maid-Servant, to whom he had " given ſome Rhubarb to hold in her hand. Not- " withſtanding which, finding it never to have pro- " duced the ſame Effect in any other Perſon, it ra- " ther ſeemed to him, that ſome other Cauſe might " have occaſioned what happened to his Maid. " Pleaſe to let me know, if in any thing elſe I can " obey your Commands, and you ſhall ever find me " ready, to the beſt of my Ability," *&c.*

We ſee then from this Letter, and from the Account I have before given of my Viſit to M. *Pivati*, that I have not been able to verify at *Venice* any of thoſe Facts, in which my Curioſity was intereſted. I might add alſo (and I ought, without Doubt, ſince I have engaged to mention exactly every thing I have been able to find out from my Enquiries upon this Subject), that of all the Perſons of the Country, who have been with M. *Pivati*, to be certified of the Truth of his Experiment from ocular Demonſtration, and whom I was able to interrogate, I found but one who atteſted them, as having ſeen them: This was a Phyſician, a Friend of M. *Pivati*, whom I found at his Houſe, and who had, as he ſaid, almoſt always aſſiſted him in his Experiments.

From *Venice* I went to *Bologna*, where I became acquainted with Dr. *Verati*, a Member of the Academy *De l'Inſtitut*. From the frequent Converſations I had with him, I was convinced that he was a learned, wiſe, and candid Man, as I had heard before.

I laid before him, without Scruple, the Doubts I had, touching the Tranſmiſſion of Odours, the Effects of lined Tubes, purging by electrizing, as well as the almoſt ſudden Cures.

Dr. *Verati* anſwered me, firſt, " That he had " made many Experiments, from the Reſult of which " it ſeemed to him, that the Odour of Balſam of " *Peru* pervaded from within to the Outſide of a " Glaſs Cylinder which he ſhewed me." This Tube however, at this time, would not convince us of its having been done, although we rubbed it with our Hands very ſtrongly. But upon my repreſenting to him, that as the Glaſs was cloſed only with wooden Stoppers, which could be taken off at Pleaſure, to put in or take out the odoriferous Subſtances, it might happen, that the Odours, agitated by the Heat, might have paſſed through the Pores of the Wood; he anſwered me, " That this was poſſible; " and although Appearances had inclined him to be- " lieve the Tranſmiſſion of theſe Odours through " the Pores of the Glaſs, he had nevertheleſs ſuſ- " pended his Judgment upon this Effect, as well as " upon that from lined Tubes, until new Proofs, " made with more Precaution, ſhou'd have entirely " diſſipated his Doubts. Secondly, with regard to the " Purging by Electricity, he had in his Houſe a Man " and Maid-Servant, who had been purged in this " manner: That at leaſt theſe two Perſons had felt " the ſame Effects as though they had taken Phyſic; " after having been electrized in M. *Bianchi*'s man- " ner: That this Effect having no other apparent " Cauſe than the preceding Electrization, *the great* " *Number of Facts of this kind, which had mani-*

" *feſted themſelves at* Turin, had determined him " to believe, that what happened to his two Ser- " vants was the natural Conſequence of this Electriza- " tion: That, with regard to the reſt, he propoſed " to try the Experiment again upon a ſufficient " Number of Perſons of another Sort; and if this " Method of Purging was not conſtant, accord- " ing to the Idea he had had thereof, he would cor- " rect, with great Freedom, what he had publiſhed " thereupon in his Works, printed in 1748."

Thirdly, Mr. *Verati* aſſured me, " That the ten " Cures, related in his Work juſt mentioned, were " exactly made in the manner they are deſcribed:" And they are related with a good deal of Prudence, and with a Simplicity which characterizes the Truth. The fifth of them was told and certified to me by the Perſon himſelf, one Day when I viſited Father *Trombelli*, Abbot of the Houſe in which he lives. Theſe Cures are not ſuch as give me Difficulty to believe them: We ſee, at leaſt, that they are made with Speed: We ſee that the Diſorder, if I may be allowed the Expreſſion, defends itſelf againſt the Remedy, and does not give place but by little and little; and that Nature makes no ſudden Tranſition from one State to the other abſolutely different, by the means of an Electricity ſcarce ſenſible. Theſe Cures, I ſay, give me no Trouble to believe them; becauſe it appears to me natural enough, and I have ſaid it a great while ago *, that a Fluid, active as the electric Matter, and which paſſes into our Bodies with ſo much

* In a Diſcourſe read to the *Royal Academy of Sciences* juſt after *Eaſter* 1746.

much Eaſe, may produce therein, in time, Alterations either * ſalutary or pernicious.

I learned nothing in the other Cities of *Italy*, which did not ſtrengthen my Doubts in relation to thoſe electrical Phænomena, which I had a Deſire to verify in the Courſe of my Travels. Pere *La Torre*, Profeſſor of Philoſophy at *Naples*; M. *De la Garde*, Director of the Coinage at *Florence*, one who has been much engaged in theſe Inquiries; M. *Guadagni*, Profeſſor of experimental Philoſophy at *Piſa*; the Marquis *Maffei*, at *Verona*; Dr. *Cornelio*, at *Placentia*; Pere *Garo*, at *Turin*; all theſe, I ſay, with very excellent and well-contrived Machines, and with a great Deſire of ſucceeding, have attempted many times to tranſmit the Odours, as well as the Powers of Drugs cloſed (carefully) in Tubes or Spheres of Glaſs, by electrizing them: All theſe have attempted to purge a Number of Perſons; and, according to the Accounts they gave me, have never gained their Point; or the little Succeſs they had, appeared too equivocal to draw therefrom Conſequences conformable to thoſe M. *Pivati* had believed to have ſeen in his Experiments.

I am now then, as it were, certain of what I began to believe laſt Year, when I printed my Treatiſe, intituled, *Recherches ſur les Cauſes particulieres des Phænomenes Electriques*: I am, I ſay, as it were certain, that M. *Pivati* has been deceived by ſome Circumſtance to which he had not given ſufficient Attention; and what makes me believe it more than ever is, that he aſſured me himſelf, that this Transfuſion of Odours, and of Drugs, through

 electrized

* See theſe *Tranſ.* No. 476. p. 479. *C. M.*

electrized Glaſs Veſſels, had never manifeſted itſelf to him but once or twice directly; I mean by a ſenſible Diminution of Bulk, and by ſuch Emanations as the Smell was capable of perceiving.

Since I have underſtood *Italian*, I have been ſurpriſed not only to find this Confeſſion in a Letter printed at *Lucca* *, but alſo to ſee, that it had not had all the Effect it ought to have had upon the Minds of thoſe, who have been in a Situation to be inſtructed: For my own Part, had I known it earlier, I might have ſaved myſelf a great Part of the Trouble I have taken in verifying the Fact; and I am aſtoniſhed, that they ſhould be deſirous of building upon ſuch very ſlender Foundations.

It is however upon this pretended Tranſmiſſion, and with a glaſs Tube, *which was cracked from one End to the other*, as M. *Pivati* tells you himſelf †; it is, I ſay, upon this Fact, than which, in my Opinion, nothing can be leſs certain, that they have eſtabliſhed the Uſe and Effects of *lined Tubes*, of which they are willing to abate nothing. But how can we reconcile theſe two things, the almoſt never failing Operation of *lined Tubes*, upon ſo many Diſtempers which are ſaid to have been cured, or conſiderably relieved, on one Part, and on the other the Tranſmiſſion ſo very ſeldom to be perceived of the Odours of the Drugs incloſed in thoſe Glaſſes, with

* Page 28. *Un tale dileguamento ſuccedutomi in un cylindro, non mi è poi veramente ſucceduto in altri, di quali mi ſon ſervito per varie guarigioni.*

† *Si conſumo la materia interna a ſegno, che ſi riduſſe non oſtante l'eſſere quaſi ermeticamente ſerato alla ſottiliezza di un delicato foglio di carta, e come un capo morto, che ne tenea più odore ni ſapore, e fino il vetro medeſimo quaſi conſunto ſi apri da ſe ſteſſo in più fiſſure per longo.*

with which you electrize? If it is truly the *Peruvian* Balſam, the Benjamin, Camphire, *&c.* which, being animated by the electric Matter, have brought about ſo many Cures, as M. *Pivati* has given us in his Writings, why do not theſe ſtrongly-ſcented Subſtances ſend forth their Effluvia copiouſly, and always, in thoſe Places where the Experiments are made? And why do they not communicate themſelves by their Odour to all Perſons, who are penetrated thereby by means of Electrification? Will they ſay, that the Electricity, ſpecifically operating upon their medical Virtue, ſeparates it from their odoriferous Quality? Miſerable Subterfuge! Which does not merit to be oppoſed ſeriouſly; and the more ſo, as it is by the Tranſfuſion of their Odours, that they pretend to be aſſured of the Efficacy of their *lined Tubes*.

I am diſpoſed to believe, that the Electricity may have cured or relieved diſtempered Perſons; but I do not find the Proofs of M. *Pivati* ſufficiently ſtrong, or ſufficiently certain, to make me conceive, that the *lined Glaſſes* have contributed to theſe good Effects. I think, and M. *Verati* himſelf appeared to me pretty much of the ſame Opinion, that if any one has been ſo happy as to cure Diſtempers by electrifying with Glaſſes containing Drugs, all that can be ſaid in Favour of theſe Subſtances is, that they have not hindered the Operation of Electricity.

M. *Pivati* appears by his Converſation an honeſt and diſintereſted Perſon, and one capable of inducing me to be of his Opinion: But among the Facts which he collects in his Writings to fortify his Proofs, I find ſome that do not do much Honour to his

his Delicacy in chooſing; and which may make him ſuſpected of too great Credulity. Would one believe with him for Example, that the electric Virtue was capable of ſetting a Watch a going, which was ſtopped; and, by its means, of regulating its Motion, when ſo diſordered as to be impracticable to be done by the Hands of the Workmen *? Would one believe with him upon the Faith of a Letter void of Authority, and without having tried it, " that an " Ounce of Mercury had been entirely evaporated " through the Pores of a Glaſs Veſſel, with which a " Man was electrized, which had made his Skin of " a leaden Colour, and which had been followed " by a copious † Salivation?" This Fact, which was ſaid to have been done at *Naples*, intereſting as it is, had there made ſo little Noiſe, that I was not able to find any Traces of it during my Stay in that City, after the printing and publiſhing of the Book, in which it is cited.

If any one ſhould think fit to ſay, that it is from Humour, or from ſome perſonal Intereſt, that I am ſo obſtinate in disbelieving the Facts publiſhed in *Italy*, which are the Subject of this Memoir, I flatter myſelf, that ſo unjuſt an Imputation will make no Impreſſion upon reaſonable People, by whom I have the Honour of being known, either perſonally, or by my Writings. Have not I received and publiſhed in *France* all the Wonders in Electricity, which

* *Reflеſſioni fiſiche ſopra la medicina ellettrica*, p. 103. *La ſubita efficacia (della ellettricita) in dar giuſto movimento alle moſtre, di orologio, o ferme, o reſtie, o ritardanti ſanza rimedio.*

† Ibid. p. 153.

which have manifeſted themſelves in *England*, in *Germany*, and in *Holland*, as ſoon as I have been able to be aſſured thereof by a Repetition of them? Have not I ſpoke and written concerning the Cure of the Paralytic of *Geneva*, as a Man truly perſuaded of the Truth of the Fact, ſince it had been ſo juſtly authenticated *? By what Caprice then am I made more difficult of believing what paſſed in *Italy* than in other Countries, if the Phænomena, which are pretended to have been ſeen there, could have been repeated; or if the Teſtimonies, which they offered me, were not conſiderably weakened, or entirely aboliſhed, when, being in the Places themſelves, I was in a Condition of knowing their juſt Value?

Had I only conſulted my perſonal Intereſt, to whom would it have been more convenient than to me, to have adopted theſe Novelties? If they were real, they would have been ſo many evident Proofs of a Principle †, by which I have endeavoured to account for the electrical Phænomena: A Principle, which as yet has ſufficiently well ſerved me, and which, having offered itſelf to Mr. *Watſon* as well to myſelf, has enabled him likewiſe to give ſome Inferences exceedingly probable concerning them: Would not Odours, would not medical Subſtances, carried through the Pores of Glaſs, prove, without Doubt, that the *effluent* electric Matter ſerved them for a Vehicle? If purging Subſtances were forced to paſs

* See my Eſſay *ſur l'electricité des corps*, printed at *Paris*, 1746, and my *Recherches ſur les Cauſes particulieres des Phænomenes electriques*, 1749.

† *Eſſai ſur l'Electricité des Corps*, p. 148. et ſuiv.

paſs into the Hand, and into the Body, of an electrized Perſon, could one doubt of their being introduced there by the *effluent* Matter, which came to the electrized Body? If the Electricity reſtores Health to a ſick Perſon, in delivering him from ſome vitious Humour, might not I ſay with great Probability, that this Effect is brought about by the Effluence of the electric Matter? Eſpecially as I have demonſtrated by Experiments, made with great Care, that this ſame Matter, in going from the Body electrized, accelerates, and conſiderably augments, the inſenſible Tranſpiration of Animals, and, in general, all organized Bodies, replete with Fluids.

I have then ſet apart my own Intereſt to follow the Truth; and if Prejudice has tended to lead me aſtray, it would be in inclining me to receive rather than call in doubt the Facts, which are the Subject of this Paper. It is only becauſe I cannot conſider them as true, that I refuſe to believe them; and this even with Regret, as they favour my Syſtem: This indeed is of no great Importance; but what makes me more deſire their Reality, is, the great Good which would reſult to Society. Could any good Subject, poſſeſſed of the Art of healing by Electricity, as M. *Pivati* pretends to be, ſpend his whole Time better than in devoting it to the Relief of a great Number of human Creatures, afflicted with great Variety of Maladies? I am induced to believe, that the Greatneſs of this Idea has impoſed upon thoſe, who have publiſhed, without Doubt, with a little too much Precipitation, this new Medicine: The great Deſire of being uſeful has made them hope; and the Goodneſs of their Hearts making them diſ-

penſe

penſe too eaſily with the Severity of a neceſſary Examination, it may be imagined, that they have conſidered as real Succeſs, what was in Truth only a Phantom.

It remains to ſay, that in theſe Reſearches I have coveted Truth, only for her own ſake; and have no Intereſt in convincing thoſe who may think proper ſtill obſtinately to believe, what has been publiſhed concerning lined Tubes, electrical Purgations, inſtantaneous Cures, *&c.* I do not pretend to make any of my Opinion, but thoſe, who, having read without Prejudice what I have here related, may find themſelves touched by my Reaſons: But if after this there can be any one, upon whom the Love of the Marvellous can make a victorious Impreſſion, I ſhall not think ill of them, if they embrace Opinions oppoſite to mine; *Qui vult decipi, decipiatur.*

XXI. *An extraordinary Caſe of a* Fracture *of the* Arm; *communicated by Mr.* John Freke, *F. R. S. Surgeon to* St. Bartholomew's Hoſpital.

Read April 5. 1750. THE following Extract of a Letter from Mr. *John Barde*, Surgeon, in *New York*, having been communicated to me, I thought the Caſe ſo curious, and to have been treated in ſo skilful and regular a manner, as to be worthy of being laid before this learned Society.

J. FREKE.

" IN *May* 1746. as Colonel *Morris*'s Lady was
" going from this City to *Morriſena*, the Co-
" lonel's Country Seat, ſhe had the Misfortune of
" being thrown out of her Chaiſe by the Horſes
" ſuddenly falling down; by which means ſhe had
" both the Bones of her left Arm broke. She was
" immediatly conveyed to the *Hermitage*, a Coun-
" try Seat belonging to the Honourable *Joſeph Mur-*
" *ray*, Eſq; which is about a Mile and a Half from
" the Place where ſhe met with this unlucky Acci-
" dent. Being ſent for by the Colonel, I examined
" the Caſe, and found the Bones broke in an ob-
" lique Direction, a very great Contuſion of the
" Muſcles, and the Arm already tumified; which,
" together with the being three Months gone with
" Child, obliged me, previous to the Reduction,
" to bleed her in the Right Arm. I then care-
" fully reduced the broken Arm, and applied the
" proper Bandages.

" The Caſe ſucceeded, with leſs Inflammation than
" uſually attends more ſimple Accidents of this Kind;
" and, in about twelve Days, ſhe ventured to go
" from the *Hermitage* to *Morriſena*, being about
" ſix Miles. But what I think remarkable in this
" Caſe is, that tho' the Ends of the fractured Bones
" had been exactly applied to each other, and tho'
" the Bandages had been continued forty Days, yet,
" upon their being removed, the Callus remained
" ſo ſoft and flexible, that her Arm could be bent
" with the greateſt Eaſe into any Poſition, and appear-
" ed perfectly ſtrait, to the Satisfaction of the Patient
" and Family. But, as I obſerved the Callus to be

" uncon-

" unconfirmed, I re-applied the Bandage, which re-
" mained on five Weeks longer.

" Upon a ſecond Examination, I found, to my
" Surprize, and the great Uneaſineſs of the Patient
" and Family, the Callus as ſoft and yielding as
" before. I therefore could not help thinking this
" Caſe to be ſimilar to two Caſes which *Hildanus*
" gives the Hiſtory of from his own Practice: For,
" as the Patient at this time was about five Months
" gone with Child, Nature determined thoſe nutri-
" tious and agglutinating Juices, which were neceſ-
" ſary to form and conſolidate the Callus, into a
" different Chanel; *viz.* to the Support and In-
" creaſe of the *Fœtus*. As a Conſequence of this
" Opinion, I contrived a Bandage made of Velvet,
" with four thin Blades of Steel, a Quarter of an Inch
" broad, and ſeven Inches long, which were covered
" with Velvet, and fixed to the Inſide of the Velvet
" Bandage; and to the Bandage itſelf I fixed four
" ſmall Buckles, with their correſponding Straps.
" The Bandage thus contrived, and buckled on the
" Arm, reſembled a Muffitie, and was wore with the
" greateſt Conveniency, keeping the Arm in a ſtrait
" Direction, for four Months longer. In the mean
" time, the Patient was made eaſy by the encourage-
" ing Hopes I gave her, that, after her Labour, the
" Oeconomy of Nature would be more immediately
" directed to the Recovery of the Uſe of her Arm.
" And, indeed, ſo it turned out: For the Callus
" remained unconfirmed, her Arm uſeleſs, and at
" particular times painful, till within nine Days of
" her Delivery; when, all on a ſudden, ſhe ac-
" quainted the Colonel, that her Arm was quite

" free from Pain, and had a very different Feeling " from what it had before. From that time, in leſs " than a Month, the Callus was intirely confirmed, " and the Patient recovered the Uſe of her Arm; " which, conſidering the oblique Direction of the " Fracture, and the long-continued Softneſs of the " Callus, has its natural Beauty and Straitneſs " wonderfully preſerved.

" I know that a Woman's Pregnancy is mentioned " in general, by ſeveral Authors, as an Hindrance of " the Callus being ſo ſoon confirmed as in other " Circumſtances. But, except the two Caſes men- " tioned by *Turner*, and taken from *Hildanus*, I " do not remember to have read any Hiſtory, where " the uſual Oeconomy of Nature, in reſtoring a " fractured Bone, was ſo intirely, and for ſo long a " Time, interrupted; and where the Cauſe of ſuch " an Interruption appears ſo plain, as in the Caſe I " have been here relating," *&c.*

XXII. *A further Account of the* Libellæ *or* May-flies, *from Mr.* John Bartram *of* Penſylvania, *communicated by Mr.* Peter Collinſon, *F. R. S.*

Read April 5. 1750. SOME time ago I laid * before the Royal Society my Obſervations on the wonderful Appearance of the *Libellæ* or May flies of *England*. This Account being peruſed by my ingenious

* See this Tranſ. p 323.

ingenious Friend Mr. *Bartram*, excited him to make the following Remarks on their Appearance in *Penſylvania*. By the Specimens before you, the May-flies of *America* have no very remarkable Difference from ours; excepting a few Days in the Fly State, they live all the Year a Water Inſect. Their Bodies being repleniſhed with an oily Matter, they eaſily quit their Husks, and riſe up to the Surface of the Water, and diſperſe themſelves a Mile or more back in the Woods, whilſt others ſtay near the Water.

May the 4th 1749. I perceived many had attained Wings, and were very thick ſpread on the Buſhes and Graſs, by the River-ſides. The ſecond Day after their leaving their aquatic Abode they caſt another Skin, after which their Tails are longer, and their Wings drier, and more tranſparent. The 5th and 6th was rainy, the 7th windy; ſo very few came out. The 8th were cool; ſo few were ſeen: But the 9th and 10th, being warm, many ſwarmed late in the Evening; and the 11th, 12th, 13th, they ſwarmed abundantly. What I call ſwarming, was their gathering thick as Bees, near the Rivers, to lay their Eggs in the Water.

In their Flight they mount to the Tops of Trees, 20 or 30 Feet high: Their Motion is ſurpriſing, hovering up and down, riſing and falling, 7 or 8 Feet at a time: This I take to be the Time and Manner of their Impregnation. After which they fly to the Brooks, caſt out their Eggs, and periſh immediately: Their Eggs ſink directly to the Bottom, and lodge amongſt the Mud and Gravel, and may be Food for ſome minute Water Animal. From their Eggs proceeds a deformed Grub, which ſubſiſts under Water,

Water, and is Food for Eels, until next Seaſon, that it attains its Fly State, and then is Food for Fiſh and Fowl.

The Reaſon of their being ſo long in coming forth this Year was, the cold chilly Weather: Other Years, in a warm Seaſon, in five Days they would have performed all their Functions, and diſappeared.

We have two other ſmaller Kinds, that very much reſemble the former, but they come later by two or three Weeks: What is moſt remarkable, the Males are black, and live ſeveral Days after the Females.

ERRATA.

No. 491. p. 8. in the Title of Art. IV. for D. *Suarez, M. D.* read *Jacobum de Caſtro Sarmento*, M. D. *Item*, the ſame in the Contents.

No. 493. p. 193. l. 2. in the Title of Art. I. and in the Contents the ſame, for *July* 15. read *July* 18

Ibid. p. 213. *May* 13. for 33, 23. (the Height of the Barometer.) read 30, 23. and *July* 24. for 22, 66. read 29, 66.

No. 494. p. 342. l. 1. for *magis vaſculum tenera*, read *vaſculum, magis tenera*,

PHILOSOPHICAL TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Preſent Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Conſiderable Parts of the WORLD.

LONDON:

Printed for C. DAVIS, PRINTER to the ROYAL SOCIETY, over-againſt *Gray's-Inn-Gate* in *Holbourn.*

M.DCC.LI.

Fig. 1
p. 143.

Fig. 2.
p. 145.

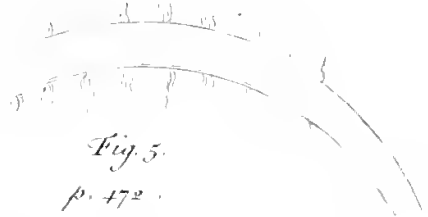


Fig. 5.
p. 472.

Fig. 3.
p. 156.

E CIMELIO REGIO

Fig. 4.
p. 158.

Fig. 6. p. 520.

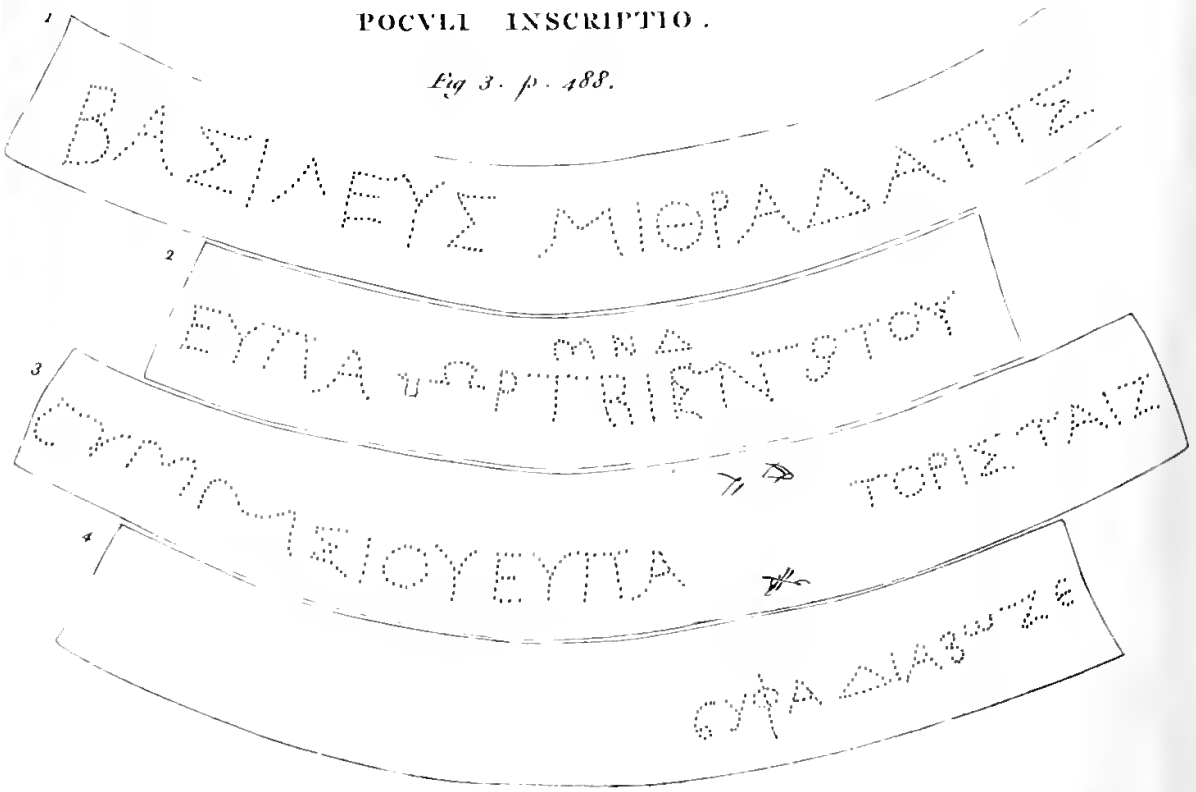
Fig. 1.

p. 479.

Fig. 2.

POCVLI INSCRIPTIO.

Fig 3. p. 488.



Philos. Trans. N.° 495 TAB. III. *p. 516.*

Fig. 1.

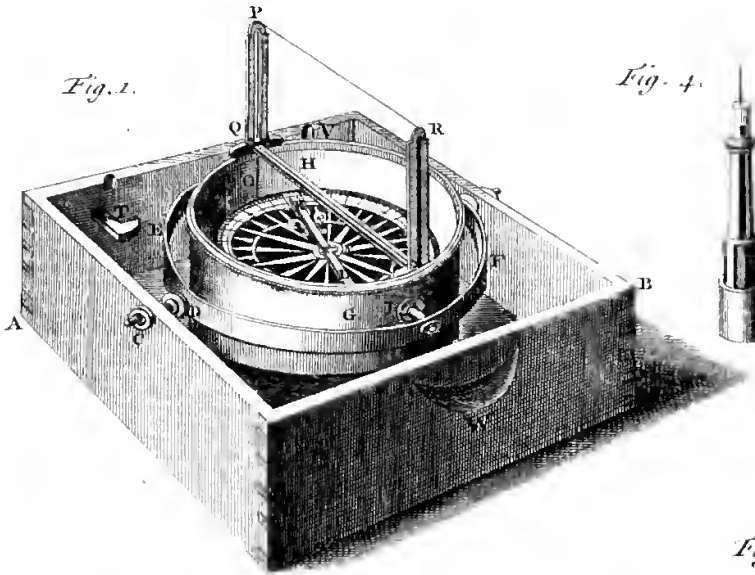


Fig. 4.

Fig. 3.

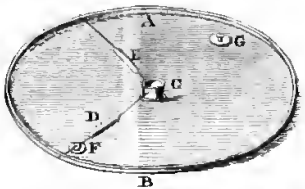
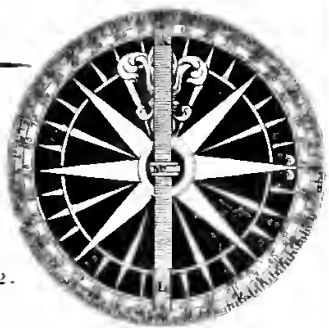
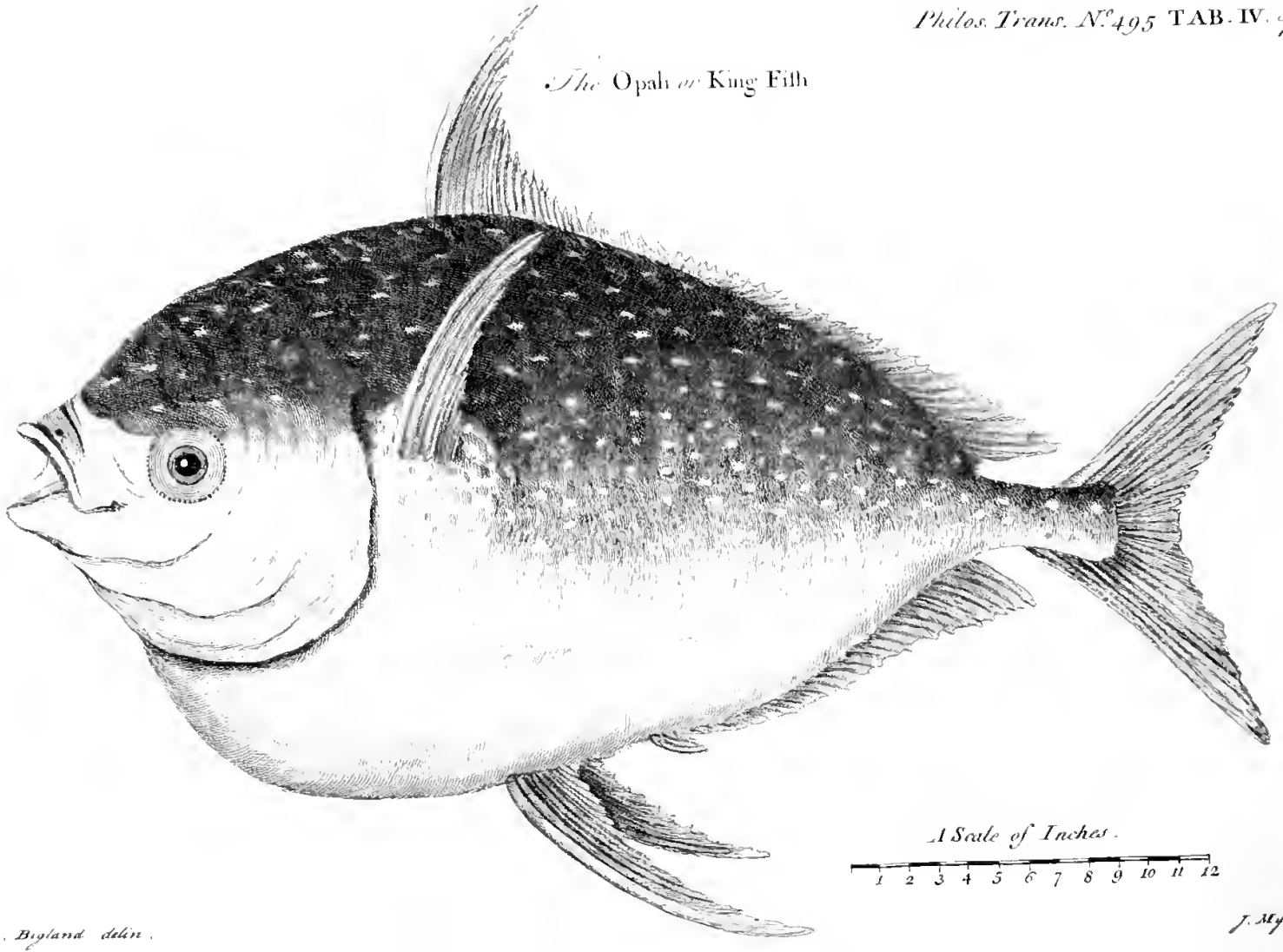


Fig. 2.



The Opah *or* King Fish



R. Bigland delin.

J. Mynde sc.

Numb. 495.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April*, *May*, *June*, and *July*, 1750.

I. *A Catalogue of the fifty Plants from* Chelsea *Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year* 1749. *p.* 403

II. *A Letter from* Daniel Peter Layard, *M. D. and F. R. S. to Dr.* Mead, *containing an Account of the Case of a young Lady who had an extraordinary* Impostume *formed in her* Stomach. *p.* 406

III. *An Account of an irregular Tide in the River of* Forth, *by Mr.* E. Wright. *p.* 412

IV. *The Case of a* Tumor *growing on the Inside of the* Bladder, *successfully extirpated by Mr.* Joseph Warner, *Surgeon to* Guy's Hospital. *p.* 414

V. *Remarks upon the* Solar *and the* Lunar *Years, the* Cycle *of* 19 *Years, commonly called the* Golden Number, *the* Epact, *and a Method of finding the Time of* Easter, *as*

it is now observed in most Parts of Europe. *By the Right. Hon.* George *Earl of* Macclesfield *F.R.S.* *p.* 417

VI. *An Account of the* Morbus Strangulatorius, *communicated in a Letter from* John Starr, *M. D. to* C. Mortimer, *M. D. Secret. R. S.* &c. *p.* 435

VII. *An Examination of the Strength of several of the* principal purging Waters, *especially of that of* Jessop's Well; *by the Rev.* Stephen Hales *D. D. & F. R. S. communicated in a Letter to* Cromwell Mortimer *M. D. Secr. R. S. with a Letter from* Swithin Adee *M. D. F.R. S. to Dr.* Hales, *on the Virtues of the said* Well. *p.* 446

VIII. *An abstract of a Discourse intitled,* Reflexions on the Medals of *Pescennius Niger,* and upon some Circumstances in the history of his Life; *writen in French by* Mr. Claude Gros de Boze, *keeper of the Medals in the French King's Cabinet,* &c. *and sent by him to Dr.* Mead, *who communicated it to this Society. By* John Ward, *Rhet. Prof. Gresh. & F. R. S.* *p.* 452

IX. *A Letter from* Robert More *Esq; to the* President, *containing several curious Remarks in his Travels through* Italy. *p.* 464

X.

X. *Extract of Letter from Mr.* William Arderon *F. R. S. to Mr.* Henry Baker *F. R. S. containing an Account of a* Dwarf; *together with a Comparison of his Dimensions with those of a Child under four Years old*; *by Mr.* David Erskine Baker. *p.* 467

XI. *Part of a Letter from* Robert More *Esq*; *to Mr.* W. Watson *F. R. S. concerning the Method of gathering* Manna *near* Naples. *p.* 470

XII. *A Letter from* John Huxham *M. D. F. R. S. to* C. Mortimer *M. D. Secr. R. S. containing Observations on the* Northern Lights, *seen* Feb. 15 *and* 16, 1749-50. *p.* 472

XIII. *A Letter from* John Starr *M. D. to* John Huxham *M. D. F. R. S. containing an Account of an* Horse *bit by a* mad Dog. *p.* 474

XIV. Descriptio Fœtus monstrosi sine ullo Sexûs Signo, *cum Regali Societate* communicata per *Job Baster*, Acad. Cæsar. et Reg. Soc. *Lond.* Soc. *p.* 479

XV. *Some Experiments on Substances resisting* Putrefaction; *by* J. Pringle *M. D. p.* 480

XVI. *An attempt to explain an antient Greek Inscription, ingraven upon a curious bronze cup*

cup with two handles, and publiſhed with a draught of the cup by Dr. Pococke, *in his* Deſcription of the Eaſt, Vol. II. Part 2. pag. 207. *By* John Ward, *Prof. Rhet. Greſh. and F. R. S.* *p.* 488

XVII. *A Letter from Mr.* Henry Baker *F. R. S. to the* Preſident, *containing Abſtracts of ſeveral Obſervations of* Auroræ Boreales *lately ſeen.* *p.* 499

XVIII. *A Deſcription of a* Mariner's Compaſs, *contrived by* Gowin Knight *M. B. F. R. S.* *p.* 505

XIX. *An Account of ſome Improvements of the* Mariners Compaſs, *in order to render the* Card *and* Needle, *propoſed by Doctor* Knight, *of general Uſe, by* John Smeaton, *Philoſophical Inſtrument-maker.* *p.* 513

XX. *The Deſcription of a* Fiſh, Opah Guinienſium, *ſhewed to the* Royal Society *by Mr.* Ralph Bigland. *p.* 518

XXI. *A Letter from* John Burton *M. D. to* C. Mortimer *M. D. & Secr. R. S. concerning the* Extirpation *of an* Excreſcence *from the* Womb. *p.* 520

ERRATA:

N°. 492, *p.* 90, *l.* 7, for 1793, read 1743; *l.* 8, for 1796, read 1746; *l.* 9, for 1798, read 1748. *ibid. pag.* 91, *Comet anno* 1729, for 91, read 41; 1729, for 906980, read 406980; 1739, for 15, read 25; 1744, for 27, read 17; *ibid. p.* 162, in the Title, *l.* 1. and in the Contents Art. XIV. dele *the Rev.* *p.* 164, *l.* 14, for *the* 112*th Year of* Nab. read *the* 1112*th Year of* Nab. *the* 24*th Day of* Thoth. *p.* 169, *l.* 19, for 313, read 383; *l.* 23, for 4^h 4′, read 21^h 4′. *p.* 172, in the Table, for 56.6, read 56′ 0″.

N°. 495. Article II. in the Title, inſtead of, *to the Preſident*, read *to Richard Mead M. D.* &c. *Ibid.* for 1749-30, read 1749-50.

Pag. 411, line 12, for *Luetus* read *Licetus*. *Ibid.* Note 7, read *Licetus*.

Page 517, line 24, for *contained* read *containing*; and for *fixing* read *fixed*.

I. *A Catalogue of the fifty Plants from* Chelſea *Garden, preſented to the Royal Society, by the worſhipful Company of Apothecaries for the Year* 1749, *purſuant to the Direction of Sir* Hans Sloane, *Bart.* Med. Reg. et Societat. Reg. *nuper* Præſ. *by* John Wilmer, *M. D.* Clariſſ. Societat. Pharmaceut. Lond. Soc. Hort. Chelſean. Præfect. et Prælect. Botan.

Read April 26. 1750.

1351. AConitum cœruleum ſeu napellus. *S. C. B. P.* 183.

1352 Aconitum Pyrenaicum; ampliore folio tenuius laciniato. *T.* 424.

1353 Adhatoda minor Canarienſis. *Pluk. Phyt.* Fig. 1.

1354 Apocynum majus Syriacum rectum. *Cornut.* 91.

1355 Ariſtolochia, Piſtolochia Cretica. *C. B.* 107.

1356 BaccharisAfricana; Coronopi folio. *Vaill. Acad.*

1357 Barba Jovis Africana; foliis viridibus pinnatis; flore cœruleo. *Boerh.*

1358 Blattaria alba. *C. B.* 241.

1359 Bupleurum foliis linearibus acutis ſeſſilibus. *Fl. Leyd.*

1360 Centaurea calicibus ſetaceo-ſpinoſis, foliis lanceolatis petiolatis dentatis. *Hort. Cliff.*

1361 Commelina foliis ovato-lanceolatis; petalis tribus majoribus æqualibus. *Lin.*

1362 Convolvulus argenteus elegantiſſimus; foliis tenuiter inciſis. *Inſt. R. H.*

1363 Convolvulus peregrinus pulcher; folio Betonicæ. *J. B.*

1364 Convolvulus Siculus minor; flore parvo auriculato. *Boc. Rar.*

1365 Digitalis lutea major; parvo flore. *Mor. Hiſt.*

1366 Dracocephalon Canarienſe triphyllon; Cedronella. *H. Amſtel.*

1367 Echium Creticum anguſtifolium rubrum. *C. B. P.* 255.

1368 Emerus Americanus; ſiliquâ incurvâ. *Inſt. R. H.*

1369 Gallium ſaxatile minimum ſupinum et pumilum. *Inſt. R. H.* 115.

1370 Glaucium hirſutum; flore phœniceo. *Tourn.*

1371 Glaucium Orientale; flore magno aureo. *T. Cor.*

1372 Helleborus Fumariæ foliis. *Amman. Ruth.* 74.

1373 Hieracium calyce barbato. *Col. Ec.* 2. 27.

1374 Jaſminum Africanum; ilicis folio; flore albo. *Com. Rar.*

1375 Linaria pumila; foliis carnoſis; floſculis minimis flavis. *C. B.* 213.

1376 Melilotus Italica; folliculis rotundis. *C. B. P.* 331.

1377 Meliſſa Romana molliter hirſuta et graveolens. *H. R. Par.*

1378 Milleria annua erecta; foliis conjugatis; floribus luteis ſpicatis. *Houſt.*

1379 Monarda floribus capitatis; caule obtuſo. *Hort. Cliff.*

1380 Myagrum ſiliculis ſulcatis rugoſis; foliis obtuſis dentatis. *Hort. Upſal.*

1381 Nardus Americana procerior; foliis cæſiis. *Pluk. Alm.*

1382

1382 Obeliſcotheca, Hydrophylli foliis, lobis latioribus. *Vaill.*

1383 Obeliſcotheca, Hydrophylli foliis, lobis anguſtioribus. *ibid.*

1384 Oxys lutea. *J. B.* 388.

1385 Partheniaſtrum Helenii folio. *Hort. Elt.*

1386 Scrophularia, Ruta canina dicta, vulgaris. *C. B.* 236.

1387 Scrophularia foliis, Filicis modo, laciniatis, vel Ruta canina latifolia.

1388 Sideritis orientalis; Phlomidis folio. *T. Cor.*

1389 Sinapiſtrum Luſitanicum, triphyllum, flore rubro ſiliquis corniculatis.

1390 Stachys alba. *Michel.*

1391 Staphylodendron Virginianum triphyllum. *T.* 616.

1392 Statice Luſitanica; Scorzoneræ folio. *Inſt. R. H.* 341.

1393 Tribulus terreſtris; foliis Ciceris; fructu aculeato. *C. B. P.*

1394 Thlaſpi Virginianum Iberidis foliis amplioribus et ſerratis. *Tourn.*

1395 Veronica cœrulea; trifido et quinquefido folio. *Fl. Bat.*

1396 Veronica petræa ſempervirens. *Pon. Bald.*

1397 Veronica Virginiana altiſſima; ſpica multiplici; floribus candidis.

1398 Urtica foliis profunde laciniatis; ſemine lini. *Amman.*

1399 Xylon Americanum præſtantiſſimum; ſemine vireſcente. *Lin.*

1400 Zacintha, ſive Cichorium verrucarium. *Matth.* 505.

II. *A Letter from* Daniel Peter Layard, *M. D. and F. R. S. to the* Preſident, *containing an Account of the Caſe of a young Lady who had an extraordinary* Impoſtume *formed in her* Stomach.

S I R,

Read May 3. 1750. THE Communication of the following Caſe, which I have the Honour of laying before you, will not, I hope, be deemed an aſſuming Step in me: My only Deſign is, in Obedience to your Commands, to give you as exact an Account as I am able of this unexpected Cure; and I ſhall eſteem it the higheſt Pleaſure, ſhould any Benefit accrue from this Obſervation. Give me leave to ſubſcribe myſelf, with all poſſible Reſpect,

S I R,

Your moſt humble and moſt obedient Servant;

Dean-ſtreet, Feb. 17. 1749 30.

D. P. LAYARD.

MISS——a young Lady of ſeventeen Years of Age, being at a Boarding-School about three Miles from this City, was, on the 28th of *November* 1745. taken with profuſe Sweats, which, after ſome Continuance, and weakening her much, were ſtopped by means of *ſaline Draughts*, made with *Elixir Vitiroli.*

On

On the Removal of thoſe Sweats an Obſtruction of the *Menſes*, with all its Symptoms, enſued. A Shortneſs of Breath, a dry Cough, an acute Pain in the Left *Hypochondrium*, *Rigors*, &c. were taken for the Signs of a *Peripneumonia*; and, the Medicines uſually preſcribed having no Effect, a Bliſter was applied on the left *Hypochondrium*. The *Fœtids*, and *Musk*, as in a *nervous* Caſe, were alſo adminiſtred in large Quantities, but with as little Succeſs.

It being thought adviſeable to bring the young Lady to Town, I firſt ſaw her on the 12th of *Feb.* 1745-6. when I obſerved a large prominent *Tumor* on the left *Hypochondrium*, which reached to Part of the Right, filling up the *Epigaſtrium* and *Scrobiculum Cordis*, where ſhe complained of a conſtant acute Pain. The *Muſcles* of the *Larynx*, *Pharynx*, and Neck, were much ſwelled, and the *Glands* indurated. The other Symptoms were a continual quick Pulſe, Thirſt, hoarſe Cough, Difficulty of breathing, *Cardialgia*, and Obſtruction in the *Oeſophagus*, ſo that, as ſoon as any Liquid "*fell down*," as ſhe expreſſed it, "*to the Pit of her Stomach*," ſhe inſtantly threw it up with violent Pain, *Borborigmi*, *Eructations*, and *Singultus*.

On the 14th, finding the Symptoms increaſe, eſpecially the Obſtruction in the *Oeſophagus*, and apprehending that an *Abſceſs* was forming in the *Stomach*, I deſired Dr. *Mead* ſhould be called in, who confirmed me in my Opinion. In order to aſſwage the Inflammation, a cooling *mucilaginous Mixture*, and a *Sperma Ceti* one, were preſcribed, as alſo a *laxative Glyſter*. Next Day, being told, that not a Drop of the Mixtures could be admitted into

into the *Stomach*, Dr. *Mead* took his Leave, adviſing the Repetition of the Glyſter every three or four Days, as Neceſſity might require, and that Nature ſhould be watched, in caſe of a favourable Turn, which He did not much expect, having obſerved, that thoſe *Abſceſſes* more frequently terminate in a *Gangrene* than by *Suppuration*.

On the 16th the Glyſter brought away with the *Fæces* ſome Pieces of Membranes, about a Finger's Length, and two in Breadth; to lubricate the *Inteſtines* I directed ten Ounces of plain Mutton Broth to be injected, which, after the firſt time, was conſtantly abſorbed and was repeated twice every Day, till the 3d of *May*.

In this State, with no other Suſtenance than theſe *Broth-Glyſters*, the *laxative* one repeated every third Day, and a warm *carminative Plaiſter* applied on the *Tumor*, did the Patient continue till the 17th of *March*, when, obſerving an Intermiſſion in the Pulſe, and hoping that a Decoction of the *Cort. Peruv.* might corroborate the Solids, if abſorbed, as the *Broth Glyſters* were, I directed eight Ounces of the Decoction to be injected, and repeated four Hours after: By Accident, the firſt was not half thrown up; the ſecond, on the 18th of *March*, at Two o'Clock in the Morning, had a very extraordinary Effect; for being entirely abſorbed, about two Hours after, the young Lady complained of a moſt acute Pain in her *Stomach*, which by its Violence brought on a profuſe Sweat, and threw her into a *Syncope*, wherein ſhe remained a full Quarter of an Hour; then, ſhrieking, made Signs to her Nurſe to bring her the Baſon; ſhe vomited near two Pounds

of *grumous Blood*, and then ſome purulent Matter; thereupon ſhe diſcharged by Stool above four Quarts of well digeſted *Pus*, with ſeveral Pieces of *Membranes*, like thoſe before-mentioned. The purulent Diſcharge continued gradually decreaſing till the 23d of *April*. *Balſamics*, and ſmall Quantities of thin Veal and Mutton-broths, were daily given. *April* the 29th the Patient was purged with Pulp of *Caſſia*. On *May* the 3d the *Mutton-broth Glyſters* were omitted, the *Stomach* now performing its Office. The 7th ten Ounces of Blood were taken from the Foot, which brought down the *Menſes*. The *Tumefaction* and *Induration* of the *Muſcles* and *Glands* of the Neck were removed by the continual Application of the *Emplaſtr. Saponac.* And after the Uſe of *Stomachics*, and *mineral* Waters, the young Lady was perfectly cured on the 17th of *June* 1746. and has continued well ever ſince.

It may not be improper to obſerve, that the *Stomach*, on account of the Number of Blood-veſſels it is furniſhed with, is as liable (1) to *Inflammations*, and *Abſceſſes*, as any Part of the human Body. Theſe are occaſioned by a Stagnation of the Blood, which, if not ſpeedily removed, muſt greatly endanger the Patient's Life, by obſtructing the neceſſary vital Functions of that *Viſcus*. The ſpeedy Progreſs of this Diſeaſe, and the Remoteneſs of the Part from proper Applications, render its Termination moſtly fatal; and, as Dr. *Mead* judiciouſly obſerved, theſe *Abſceſſes* more frequently terminate by a *Gangrene*, than

(1) *Boerhave* in Aphoriſm. de ventricul. inflam. p. 228. Articul. 951. 952. 955.

than come to *Suppuration*. Thoſe that do ſuppurate, generally form Ulcers, penetrating into the Cavity of the *Abdomen*, and ſometimes alſo perforate the *Integuments*, as the following recorded Obſervations teſtify. (1) " Monſieur PETIT has found a " *carcinomatous* and *fiſtulous Ulcer*, which eat " through the *Fundus Ventriculi*, and the *Integu-* " *ments* of the *umbilical Region*.

(2) " Monſieur *Duverney* alſo found a Hole in a " *Stomach*, which he could paſs his Thumb through: " This Hole was near the *Pylorus*, which was ex- " traordinarily dilated.

(3) " Monſieur LITTRE obſerved an Ulcer of five " Lines Diameter, about one Inch and a half from " the *Pilorus*; and found three Pints of *grumous* " and *ſerous* Blood in the *Stomach* of a young Man " who had voided large Quantities of Blood.

(4) " The ſame Gentleman gives an Account of a " *Tumor* on the right Side, which being opened " between the *laſt* of the *true Ribs*, and the *firſt* of " the *falſe ones*, there iſſued out *Pus*, *Stones*, and " the *Succus Gaſtricus*, with Pieces of digeſted Food.

(5) " And Mr. ATKINSON tells us in the Philoſo- " phical Tranſactions, that he opened a *Tumor* on " the upper Part of the Belly, out of which Open- " ing part of the *Omentum* came, and whatever the " Patient eat or drank for eight or ten Days: Yet " the

(1) Mem. de l'Academ. des Sciences, Ann. 1716. p. 312.
(2) Hiſt. de l'Academ. des Sciences, Ann. 1704. p. 27.
(3) Ibid. p. 30.
(4) Ibid. p. 28.
(5) Philoſ. Tranſ. No. 371.

" the Patient, contrary to his Expectations, was " cured in ſix Weeks."

But the following Obſervation from FORESTUS comes the neareſt to our Caſe " *Puella quindecim an-* " *norum, per biennium ferè cum de dolore ventriculi* " *conquereretur, anno tertio tumorem manifeſté vide-* " *runt parentes, in eo loco; neque tunc quicquam* " *conſilii aut remedii tentatum. Hinc ruptionem* " *animadverterunt, excrevitque puella materiam,* " *bilioſam, pituitoſam, ac ſanioſam, per alvum: ex* " *his apoſtema apparuit,*" &c. (6).

" LUETUS (7) relates ſeveral Inſtances of Perſons " who have lived a long while without Food, but " then they could admit of Liquids; and the young " Lady which Monſieur LITTRE (8) nouriſhed with " *Broth-glyſters*, in which a Yolk or two of Eggs, " and ſometimes a Glaſs of Wine, were mixt, could " alſo keep Water in her *Stomach*, tho' no other " Fluid." An Advantage which our Patient was deprived of.

From what I have related it appears, that our young Lady had an *Abſceſs* in her Stomach, which gradually ripened, and then broke, ſuppurated, digeſted, and cicatrized, as all other *Abſceſſes* do; and that during this time, which was near three Months, ſhe was almoſt all the while nouriſhed ſolely by the *Mutton-Broth Glyſters*.

III. *Ac-*

(6) *Foreſtus* Obſerv. 33. de ventricul. ulcer.
(7) *Luetus* de his qui diu vivunt ſine alimento.
(8) Mem. de l'Academ. des Sciences. Ann. 1716. p. 183.

III. *Account of an irregular Tide in the River of* Forth, *by Mr.* Edward Wright.

Read May 3. 1750. AS the following Account of a very uncommon anomalous Tide in the River of *Forth*, contains ſeveral Circumſtances worthy Obſervation, I thought it might not be diſagreeable to that learned and famous Society to which I addreſs it.

There are in this River, at Ebbing and Flowing, certain irregular Motions, not to be found in any other River in *Scotland*, perhaps in *Great Britain*, or even in all *Europe*, called by the common People betwixt the Villages of *Alloa* and *Culroſs*, Leakies, which Name I ſhall likewiſe make uſe of, for want of a better. This Leaky is this: When the River is flowing, before high Water, it intermits and ebbs for a conſiderable time, after which it reſumes its former Courſe, and flows till high Water; and, *vice verſa*, in the Ebbing, before low Water, the River flows again for ſome time, and then ebbs till low Water. The Leaky begins at a Place called *Queen's Ferry*, ſeven Miles above *Leith*, at neap Tide, and low Water, and goes to the Houſe of *Maner*, which is about twenty-five Miles above *Queen's Ferry*, which is to be underſtood by Water; for in this River, from a little above *Alloa* to *Stirling*, there are ſuch a prodigious Number of Turnings and Windings, that though it be but four Miles betwixt theſe two Places by Land, yet it is twenty-four by Water. This I take notice of rather, as I take theſe Windings to be the Cauſe of the Leakies. At Neap Tide and high

high Water, as alſo at Spring Tide and low Water, the Leaky reaches as far as the Sea fills, which is to the Groves of *Craigforth*, nineteen Miles above *Maner* Houſe, and three above the Town of *Stirling*. At *Queen's Ferry* there are no Leakies at Neaps and Springs at high Water, nor in the latter at low Water; they begin betwixt *Borrowſtowneſs*, a Village about ſeven Miles above *Queen's Ferry*, and the Mouth of a Rivulet called *Carron*, five or ſix Miles further up the River than *Borrowſtownneſs*. What is very remarkable, in the very loweſt Neaps the Leaky, after it has ebbed for ſome time, before high Water, makes up again, and will be two Feet higher than the Main Tide. In the Beginning of the Spring Tides, it does not riſe ſo high by a Foot: At the dying of the Stream, it is often two Feet higher than the Main Tide, which is to be underſtood, before high Water, when the Leaky makes up again. At Neap Tide and low Water it will ebb two Hours, and fill as much, and at full Water ebb an Hour, and fill another.

It is likewiſe to be remarked, that at Change of the Moon, at low Water, the Leaky will continue two Hours, the Beginning of the Tide for that Time, which then ſtands, and does not ebb till Flood (the Beginning of the Flowing), and at full Water, will ebb and flow an Hour or more.

It is obſervable, that at full Moon, there are no Leakies, either at high or low Water, in the Spring Tides which are at that time, but in the Neaps which follow them, theſe Motions are obſervable, as before deſcribed; as alſo in the Spring Tides, which happen upon the Change of the Moon, called by the Commonalty, the Overloup, there are

Leakies both at high and low Water. All this is to be underſtood, when the Weather is ſeaſonable; for, otherwiſe, theſe Motions are not ſo diſcernible.

This Account I have collected partly from my own Obſervation, having paſt a great Part of my Life at a Country-ſeat near *Aloa*, where the Leakies are to be ſeen in great Perfection, and partly from what I have learned from People living on different Parts of the River, whoſe Obſervations, as well as my own, I find exactly agree with thoſe of a learned * Relation of mine, who, near ſeventy Years ago, diligently obſerved and enquired into the Phænomena of this irregular Tide.

IV. *The Caſe of a* Tumor *growing on the Inſide of the* Bladder, *ſucceſsfully extirpated by* Joſeph Warner, *Surgeon to* Guy's Hoſpital; *communicated in a Letter to the* Preſident.

Read May 10. 1750.

AN Excreſcence or Tumor ariſing from the internal Coat of the Bladder is a Diſeaſe, though not very common, yet ſufficiently known to the Curious: But I believe that hitherto, no one has attempted the Cure of this Diſorder by Extirpation, nor indeed can it be ſuppoſed, that the Inſtances are frequent, where the Operation is practicable. But as it is notorious from the Hiſtory of Phyſick, and Surgery, that ſeveral Diſorders which were

---

* His Obſervations were communicated to Sir *Robert Sibbald*, in order to aſſiſt him in compiling a *Scotiſh* Atlas.

were formerly unobſerved, have been found to occur frequently, after their Nature has been once diſcoverd, and exactly deſcribed, I flatter myſelf the Publication of this Account may poſſibly throw ſome Light on the preſent Subject.

Mary Bevan, aged 23, on the 24th of *June* 1747, ſtrained herſelf by endeavouring to lift a great Weight; ſhe was immediately ſeized with violent Pain in the Small of her Back, and a total Suppreſſion of Urine; which Symptoms, notwithſtanding the ſeveral Methods uſed for her Relief, continued till the 29th of the ſame Month; when an eminent Phyſician and Man-midwife was called to her Aſſiſtance; who drew off her Urine with the Catheter. During the Suppreſſion, ſhe was ſeized with an acute Fever, and for 18 or 20 Hours before her Urine was drawn off, ſhe diſcharged by the Mouth a great Quantity of ſaltiſh Water tinged with Blood; which, upon lying down, flowed in ſo great Quantities as to threaten Suffocation.

In *April* 1750, ſhe applied to me: Upon Enquiry I learnt ſhe had never been able, from the Moment of the Accident, to void a Drop of Urine without the Aſſiſtance of the Catheter, which had been made uſe of ever ſince two or three times every twenty-four Hours; that ſhe was in continual Pain, and had been lately much weakened by having ſeveral times loſt conſiderable Quantities of Blood, occaſioned by the Force made uſe of for the Introduction of that Inſtrument. Upon examining her with my Fore-finger, which I introduced with great Difficulty through the *Meatus Urinarius*, I diſcovered a conſiderable Tumor, which ſeemed to be of a fleſhy Subſtance, and took its Riſe from the lower Part of

the

the Bladder near its Neck; the Extent of which I could with Difficulty reach. She informed me, ſhe firſt diſcovered this Swelling about twenty Months before. I obſerved it to protrude a little way out of the *Meatus Urinarius* upon ſtraining to make Water when the Bladder was full; but, upon ceaſing to ſtrain, it preſently returned.

It had preſerved pretty nearly the ſame Appearance ever ſince it was firſt taken notice of; and about eighteen Months ago, a ſmall Inciſion was made into it, on Preſumption of its containing a Fluid, but without any Effect.

The Method I took for the Extirpation of the Tumor was this: Having firſt prepared her as before the Operation for the Stone; when her Bladder was full, I made her ſtrain as though ſhe was going to make Water, upon which I perceived the Tumor to protrude a little; this I effectually ſecured from returning into the Bladder by the Help of a crooked Needle and Ligature paſſed through the Tumor in different Directions, and endeavoured to draw it out through the *Meatus Urinarius*, but could not effect it by reaſon of its Largeneſs; ſeeing this, I dilated the *Meatus Urinarius* on the right Side by cutting it upwards about half way towards the Neck, when by pulling the Tumor forwards, I had ſufficient room for tying a Ligature round its Baſis, which was very broad.

For the three firſt Days after the Operation, ſhe complained of a good deal of Pain in the *Abdomen*.

On the ſixth Day, the Tumor dropt off.

From the firſt of the Operation, ſhe voided her Urine without any Aſſiſtance, and is now perfectly well in every reſpect.

V. *Remarks upon the* Solar *and the* Lunar *Years, the* Cycle *of* 19 *Years, commonly called the* Golden Number, *the* Epact, *and a Method of finding the Time of* Easter, *as it is now observed in most Parts of* Europe. *Being Part of a Letter from the Right Honourable* George *Earl of* Macclesfield *to* Martin Folkes, *Esq*; President *of the* Royal Society.

Of the Solar Year.

Read May 10. 1750. THE mean *Tropical Solar Year*, or that mean Space of Time wherein the Sun, or Earth, after departing from any Point of the Ecliptic, returns to the same again, consists, according to Dr. *Halley*'s Tables, of 365^d, 5^h, $48'$, $55''$: Which is less by $11'$, $5''$, than the mean *Julian* Year, consisting of 365^d, 6^h, $0'$, $0''$.

Hence the Equinoxes and Solstices anticipate, or come earlier than the *Julian* Account supposes them to do by $11'$, $5''$, in each mean *Julian* Year; or $44'$, $20''$ in every four; or 3^d, 1^h, $53'$, $20''$, in every four hundred *Julian* Years.

In order to correct this Error in the *Julian* Year, the Authors of the *Gregorian* Method of regulating the Year, when they reformed the Calendar in the Beginning of *October* 1582, directed that three intercalary Days should be omitted or dropped in every four hundred Years; by reckoning all those Years, whose

whoſe Date conſiſts of a Number of entire Hundreds not diviſible by 4, ſuch as 1700, 1800, 1900, 2100, *&c.* to be only Common, and not Biſſextile or Leap Years, as they would otherwiſe have been; and conſequently omitting the intercalary Days, which, according to the *Julian* Account, ſhould have been inſerted in the Month of *February* in thoſe Years. But at the ſame time they order'd that every fourth hundredth Year, conſiſting of a Number of entire Hundreds, diviſible by 4, ſuch as 1600, 2000, 2400, 2800, *&c.* ſhould ſtill be conſidered as Biſſextile or Leap Years, and, of conſequence, that one Day ſhould be intercalated as uſual in thoſe Years.

This Correction, however, did not entirely remove the Error: For the Equinoxes and Solſtices ſtill anticipate 1^h, $53'$, $20''$ in every four hundred *Gregorian* Years.

But that Difference is ſo inconſiderable as not to amount to twenty-four Hours, or to one whole Day, in leſs than 5082 *Gregorian* Years.

Of the Lunar Year, Cycle of 19 Years, *and the* Epact.

The Space of Time betwixt one mean Conjunction of the Moon with the Sun and the next following, or a mean *Synodical Month*, is equal to 29^d, 12^h, $44'$, $3''$, $2'''$, 56^{iv}, according to Mr. *Pound*'s Tables of mean Conjunctions.

The Common Lunar Year conſiſts of 12 ſuch Months.

The

The Intercalary or *Embolimæan* Year conſiſts of 13 ſuch Months.

In each Cycle of 19 Lunar Years, there are 12 Common, and 7 Intercalary or *Embolimæan* Years, making together 235 Synodical Months.

It was thought, at the time of the General Council of *Nice*, which was holden in the Year of our Lord 325, that 19 *Julian* Solar Years were exactly equal to ſuch a Cycle of 19 Lunar Years, or to 235 Synodical Months; and therefore, that, at the End of 19 Years, the New Moons or Conjunctions would happen exactly at the ſame Times, as they did 19 Years before: And upon this Suppoſition it was, that, ſome time afterwards, the ſeveral Numbers of that Cycle, commonly called the Golden Numbers, were prefixed to all thoſe Days in the Calendar, on which the New Moons then happened in the reſpective Years correſponding to thoſe Numbers; it being imagined, that whenſoever any of thoſe Numbers ſhould for the future be the Golden Number of the Year, the New Moons would invariably happen on thoſe Days in the ſeveral Months, to which that Number was prefixed.

But this was a Miſtake:

	d	h	′	″	‴
For 19 *Julian* Solar Years contain	6939,	18,	0,	0,	0
Whereas 235 Synodical Months contain only . . .	6939,	16,	31,	56,	30
And are therefore leſs than 19 *Julian* Solar Years by	0,	1,	28,	3,	30.

This Difference amounts to a whole Day very nearly in 310.7 Years, the New Moons anticipating,

or falling earlier, by 24 Hours in that Space of Time, than they did before: And therefore now in the Year 1750, the New Moons happen above four Days and a half ſooner, than the Times pointed out by the Golden Numbers in the Calendar.

In order therefore to preſerve a ſort of regular Correſpondence betwixt the Solar and the Lunar Years, and to make the Golden Numbers, prefixed to the Days of the Month, uſeful for determining the Times of the New Moons, it would be neceſſary when once thoſe Golden Numbers ſhould have been prefixed to the proper Days, to make them anticipate a Day at the End of every 310.7 Years, as the Moons will actually have done; that is to ſet them back one Day, by prefixing each of them to the Day preceding that, againſt which they before ſtood.

But as ſuch a Rule would neither be ſo eaſily comprehended or retained in Memory, as if the Alteration was to be made at the End or at the Beginning of complete Centuries of Years; the Rule would be much more fit for Practice, and keep ſufficiently near to the Truth, if thoſe Numbers ſhould be ſet back nine Days in the Space of 2800 Years; by ſetting them back one Day, firſt at the End of 400 Years, and then at the End of every 300 Years for eight times ſucceſſively: whereby they would be ſet back, in the whole, nine Days in 2800 Years. After which they muſt again be ſet one Day back at the End of 400 Years, and ſo on, as in the preceding 2800 Years. By which means the Golden Numbers would always point out the mean Times of the New Moons, within a Day of the Truth.

It is plain however that the Lunar Year will have loſt one Day more than ordinary, with reſpect to the Solar Year, whenever the New Moons ſhall have anticipated a whole Day; as they will have done at thoſe times, when it is neceſſary that the Golden Numbers ſhould, by the Rule juſt now given, be ſet back one Day: and conſequently the Epact, for that and the ſucceeding Years, muſt exceed by an Unit the ſeveral correſponding Epacts of the preceding 19 Years.

For the Epact is the Difference, in whole Days, betwixt the common *Julian* Solar and the Lunar Year; the former being reckoned to conſiſt of 365, and the latter of only 354 Days. If therefore the Solar and the Lunar Year at any time ſhould commence on the ſame Day, the Solar would, at the End of the Year, have exceeded the Lunar by 11 Days: which Number 11 would be the Epact of the next Year: 22 would be the Epact of the Year following, and 33 the Epact of the Year after that, the Epacts increaſing yearly by 11. But as often as this yearly Addition makes the Epact exceed 30, thoſe 30 are rejected as making an intercalarry Month, and only the Exceſs of the Epact above 30 is accounted the true Epact for that Year. Thus when the Epact would amount to 31, 32, 33, 34, *&c.* the 30 is rejected, and the Epact becomes 1, 2, 3, 4, *&c.*

Since therefore the Lunar Year will have loſt a Day more than ordinary, in reſpect of the Solar Year, whenever it is neceſſary to ſet the Golden Numbers one Day back, as was before obſerved; it follows, that the Epact muſt at the ſame time be increaſed by an Unit more than uſual; the Difference betwixt the Solar and the Lunar Year having been juſt ſo

much greater than uſual. That is, 12 muſt be added, inſtead of 11, to the Epact of the preceding, in order to form what will be the Epact of the then preſent Year. Which Addition of an Unit extraordinary to one Epact will occaſion all the ſubſequent Epacts (which will follow each other in the uſual manner, each exceeding the foregoing by 11) to be greater by an Unit than their reſpectively correſponding Epacts of the preceding 19 Years.

If therefore, inſtead of the Golden Numbers, the Epacts of the ſeveral Years were prefixed, in the manner the *Gregorians* have done, to the Days of the Calendar, in order to denote the Days on which the New Moons fall in thoſe Years whereof thoſe Numbers are the Epacts; there would never be Occaſion to ſhift the Places of thoſe Epacts in the Calendar; ſince the Augmentation by an Unit extraordinary of the Epacts themſelves would anſwer the Purpoſe, and keep all tolerably right.

Thus in a very eaſy Method may the Courſe of the New Moons be pointed out, either by the Golden Numbers, or by the Epacts, according to the *Julian* Account or Manner of adjuſting the Year, which goes on regular and uniform without any Variation.

But the regulating theſe things for thoſe who uſe the *Gregorian* Account, is an Affair of more Intricacy; and for them it will require more Conſideration to determine, when the Epacts are to be more than ordinarily augmented, and at what Times they are to continue in their uſual Courſe; nay, to know when they are not only not to be extraordinarily augmented, but alſo when they are to be diminiſhed by an Unit, by increaſing one of them by 10 only inſtead of 11 as uſual: and this happens much oftener with the *Gregorians*,

Gregorians, than the increaſing one of them by 12 inſtead of 11. For, in every *Gregorian* Solar Year, whoſe Date conſiſts of any Number of entire Hundreds not diviſible by 4, it is ſuppoſed that the Equinox has anticipated one whole Day; and therefore one Day, that which ought to be the intercalary one, is omitted; and conſequently the preceding Solar Year, where one Day was loſt, exceeded the Lunar Year by 10 Days only inſtead of 11.

In order therefore to adapt the before-mention'd Rule to the *Gregorian* Account, and to know in what Years the Epacts ſhould either be extraordinarily augmented or diminiſhed, and the Golden Numbers ſhould either be ſet backwards or forwards in the Calendar; the following Rules and Directions muſt be obſerved.

Firſt. That in the Years 1800, 2100, 2700, 3000, *&c.* where the Number of entire Hundreds is diviſible by 3, but not by 4, the *Gregorian* Solar, as well as the Lunar Year, will have loſt a Day; and conſequently the Difference betwixt them will be the ſame as uſual: Therefore in thoſe Years there muſt be no Alteration, either in the Epacts or the Golden Numbers; but the former muſt go on in the ſame manner, and the latter ſtand prefixed to the ſame Days in the Calendar, for another, as they did for the laſt hundred Years.

2dly. The like will happen in the Years 2000, 2800, 3200, *&c.* where the Number of entire Hundreds is diviſible by 4, but not by 3: For neither the *Gregorian* Solar nor the Lunar Year is to be altered; and therefore the Epacts muſt go on, and the Golden Numbers ſtand, as they did before.

But,

But, 3dly, In the Years 2400, and 3600, whoſe Number of entire Hundreds is diviſible both by 3 and 4, the *Gregorian* Solar Year goes on as uſual, and the Lunar Year has loſt a Day. The Difference therefore betwixt them being 12, the Epact of the preceding Year muſt be augmented by that Number inſtead of 11, in order to form the Epact of the then preſent Year; whereby a new Set of Epacts will be introduced, exceeding their precedent correſponding Epacts by an Unit: And the Golden Numbers muſt be ſet one Day back in the Calendar.

4thly and laſtly, In the Years 1900, 2200, 2300, 2500, *&c.* where the Number of Hundreds is diviſible neither by 3 nor 4; the *Gregorian* Solar Year having loſt one Day, and the Lunar none, the Difference betwixt them being only 10; that Number only, and not 11, is to be added to the Epact of the preceding, in order to form the Epact of that, the then preſent Year; whereby a new Set of Epacts will be introduced, all of them leſs by an Unit than their precedent correſponding Epacts: And the Golden Numbers muſt be ſet a Day forwarder in the Calendar; that is, be prefixed to the Day following that, againſt which they ſtood in the precedent hundred Years.

This Method would preſerve a ſort of Regularity betwixt the Solar and the Lunar Years; and, by means of the Rules and Directions before-mentioned, the Days of the New Moons might be pointed out, either by the Golden Numbers or by the Epacts, placed in the Calendar for that Purpoſe; according to the *Julian* Account for ever, and according to the *Gregorian* Account till the Year 4199 incluſive, after which

which there muſt be ſome little Variation made in the four laſt Precepts or Rules; but it would be to little Purpoſe now, to attempt the framing of a new Set of Rules for ſo diſtant a Time.

The *Gregorians* have choſen to make uſe of the Epacts to determine the Days of the New Moons, and follow pretty nearly the Rules preſcribed above; except that they order the Epacts to have an additional Augmentation of an Unit eight times in 2500 Years, beginning with the Year 1800, as at the End of 400 Years; to which 400 Years if there be added three times ſeven hundred, or 2100 Years, the Period of 2500 Years will be completed in the Year 3900. After which they do not make their extraordinary Augmentation of an Unit in the Epacts, till at the End of another Term of 400 Years; which defers that Augmentation from the Year 4200 to the Year 4300. And this is the Reaſon that the Rules above deliver'd will require a Variation in the Year 4200; whereas it is directed in this Paper that the Epacts ſhould be augmented, or (which is the ſame thing) the Golden Numbers be ſet back in the Calendar nine times in 2800 Years. This ariſes from the *Gregorians* ſuppoſing, that the Difference betwixt 19 Solar and as many Lunar Years would not amount to a whole Day in leſs than 312 Years and a half; whereas it has appeared above, that it would amount to a whole Day in 310.7 Years. But although the Rule preſcribed in this Paper comes much nearer to the Truth, yet the Error in either Caſe is very inconſiderable, being ſo ſmall as not to amount to a whole Day in many thouſand Years; and therefore is not worth regarding.

A Method of finding the Time of Eaſter, *as it is obſerved in moſt Parts of* Europe.

From what has been already ſaid, a Method may be obtained, for fixing, with ſufficient Exactneſs, the Time of the Celebration of the Feaſt of *Eaſter*, which is governed by the *Vernal Equinox*, and by the Age of the Moon neareſt to it. The former whereof, when once rightly adjuſted, may (by the Corrections mentioned in that Part of this Paper which relates to the Solar Year) be made to continue to fall at very near the ſame time with, or at moſt not to differ a whole Day from the true *Equinox:* and the ſame Rules and Directions, which, as was before ſhewn, would, without any great Error, point out the Times of the firſt Day of the Moon, would with equal Certainty point out the fourteenth, fifteenth, or any other: And thus the Times of the Oppoſitions or the Full Moons might be as well marked out thereby, as thoſe of the Conjunctions or the New Moons.

I ſhall not at preſent take notice of the Canon of the Council of *Nice*, in the Year of our Lord 325, which directs the Time of celebrating the Feaſt of *Eaſter*, or of the Reaſons upon which that Canon was founded. Nor ſhall I endeavour to explain the Rule now in Uſe in the Church of *England* for finding *Eaſter:* For, beſides that ſuch an Explanation would extend this Paper to an improper Length, thoſe Points have already been treated of by ſeveral much abler Hands, and particularly by our Countryman the learned Dr. *Prideaux*. Nor is it my Intention to enter far into the

the Methods uſed by the *Gregorians*, or thoſe of the Church of *Rome*, or by any other Nations or Countries, for finding the Time of that Feaſt. As to our own, I ſhall only obſerve, that the Method now uſed in *England*, for finding the fourteenth Day of the Moon, or the Eccleſiaſtical Full Moon, on which *Eaſter* dependeth, is, by Proceſs of Time, become conſiderably erroneous: as the Golden Numbers, which were placed in the Calendar, to point out the Days on which the New Moons fall in thoſe Years of which they are reſpectively the Golden Numbers, do now ſtand ſeveral Days later in the ſame than thoſe New Moons do really happen. Which Error, as was before obſerved, ariſes from the Anticipation of the Moons ſince the Time of the Council of *Nice:* And as the *Vernal Equinox* has alſo anticipated eleven Days ſince that time; neither that Equinox, nor the New Moons, do now happen on thoſe Days upon which the Church of *England* ſuppoſes them ſo to happen.

When Pope *Gregory* XIII. reformed the *Julian* Solar Year, he likewiſe made a Correction as to the Time of celebrating the Feaſt of *Eaſter*, by placing the Epacts (which he directed to be made uſe of for the future inſtead of the Golden Numbers) much nearer to the true Times of the New Moons than the Golden Numbers then ſtood in the old Calendar: I ſay, *much nearer to the true Times*; becauſe in fact the Epacts, as placed by him, were not prefixed to the exact Days upon which the New Moons then truly fell. And this was done with Deſign, and for a Reaſon which it is not material to the Purpoſe of this Paper to mention.

But the Church of *England*, and that of *Rome* or the *Gregorians*, do ſtill agree in this; that both of them mark (the former by the Golden Numbers, and the latter by the Epacts correſponding to them) the Days on which their Eccleſiaſtical New Moons are ſuppoſed to happen: And that fourteenth Day of the Moon incluſive, or that Full Moon, which falls upon, or next after, the 21ſt Day of *March*, is the Paſchal Limit or Full Moon to both: And the *Sunday* next following that Limit or Full Moon, is by both Churches celebrated as *Eaſter* Day. But the 21ſt of *March* being reckoned, according to the *Gregorian* Account or the New Style, eleven Days ſooner than by the *Julian* Account or the Old Style, which is ſtill in Uſe among us; and their Eccleſiaſtical New Moons being three Days earlier than thoſe of the Church of *England*; it happens that although the Church of *England* and that of *Rome* often do, yet more frequently they do not, celebrate the Feaſt of *Eaſter* upon the ſame natural Day.

It might however be eaſier for both, and could occaſion no Inconvenience, now that Almanacks, which tell the exact Times of the New Moons, are in moſt Peoples Hands; if all the Golden Numbers and Epacts now prefixed to thoſe Days of the Calendar, in our Book of Common Prayer, and in the *Roman Breviary*, on which the reſpective Eccleſiaſtical New Moons happen, were omitted in the Places where they now ſtand; and were ſet only againſt thoſe fourteenth Days of the Moon, or thoſe Full Moons, which happen betwixt the 21ſt Day of *March* and the 18th of *April*, both incluſive. Since no fourteenth Day or Full Moon, which happens before the 21ſt of

of *March*, or after the 18th Day of *April*, can have any Share in fixing the Time of *Eaſter*. By which means the Trouble of counting to the fourteenth Day, and the Miſtakes which ſometimes ariſe therefrom, would be avoided.

We do as yet in *England* follow the *Julian* Account or the Old Style in the Civil Year; as alſo the Old Method of finding thoſe Moons upon which *Eaſter* depends: Both of which have been ſhewn to be very erroneous.

If therefore this Nation ſhould ever judge it proper to correct the Civil Year, and to make it conformable to that of the *Gregorians*, it would ſurely be adviſeable to correct the Time of the Celebration of the Feaſt of *Eaſter* likewiſe, and to bring it to the ſame Day upon which it is kept and ſolemnized by the Inhabitants of the greateſt Part of *Europe*, that is, by thoſe who follow the *Gregorian* Account. For tho' I am aware, that their Method of finding the Time of *Eaſter* is not quite exact, but is liable to ſome Errors; yet I apprehend, that all other practicable Methods of doing it would be ſo too: And if they were more free from Error, they would probably be more intricate, and harder to be underſtood by Numbers of People, than the Method of determining that Feaſt either by a Cycle of Epacts, as is practiſed by the *Gregorians*, or by that of 19 Years or the Golden Numbers, in the manner propoſed in the following Part of this Paper: And it is of no ſmall Importance, that a Matter of ſo general a Concern, as the Method of finding *Eaſter* is, ſhould be within the Reach of the Generality of Mankind, at leaſt as far as the Nature of the thing will admit.

For which Reaſon, in caſe the Legiſlature of this Country ſhould before the Year 1900, think fit to make our Civil Year correſpond with that of the *Gregorians*, and alſo to celebrate all the future Feaſts of *Eaſter* upon the ſame Days upon which they celebrate them; this laſt Particular might be eaſily effected, without altering the Rule of the Church of *England* for the finding of that Feaſt: And this only by advancing the Golden Numbers, prefixed to certain Days in the Calendar, 8 Days forwarder for the New Moons, or 21 Days forwarder for the fourteenth Days or Full Moons, than they now ſtand in our Calendar.

In order to explain this, it muſt be obſerved, that the *Gregorian* Account or the New Style is eleven Days forwarder than the *Julian* Account or the Old Style, which we ſtill make uſe of; that is, the laſt Day of any of our Months is the eleventh Day of their next ſucceeding Month. If therefore their Eccleſiaſtical New Moons fell on the ſame Days with thoſe of the Church of *England*, the Golden Number 14, which now ſtands againſt the laſt Day of *February* in our that is the *Julian* Calendar, ſhould, when we ſhould have adopted the *Gregorian* Calendar, be prefixed to the 11th Day of *March*. But ſince their Eccleſiaſtical New Moons happen 3 Days earlier than our Eccleſiaſtical New Moons at preſent do; ſo much ſhould be deducted from thoſe 11 Days, by which the Golden Numbers ought otherwiſe to be advanced; and the Golden Number 14 ſhould not be placed againſt the 11th, but the 8th Day of *March*: Which being reckoned the firſt Day of the Moon, if we count on to the fourteenth Day of the ſame incluſive, that would be found to fall on the 21ſt Day of *March*; on which Day

Day the *Gregorian* Paſchal Limit or Full Moon will happen when the Golden Number is 14. And the like Courſe ſhould be taken with the reſt of the 19 Golden Numbers; which ought to be placed 8 Days forwarder than they now ſtand, if they are to point out the New Moon; or 21 Days forwarder than they are at preſent, if they are to mark the fourteenth Day of the Moon or the Full Moon: The latter of which, as has been ſhewn, would be more eligible, than to prefix thoſe Numbers to the Days on which the New Moons happen.

Thus may the Rule and Method now uſed in the Church of *England*, be moſt eaſily adapted to ſhew the Time of *Eaſter*, as it is obſerved by the *Gregorians*, till the Year 1900; at which Time, and at the other proper ſucceeding Times, if the Golden Numbers in the Calendar ſhall either be advanced or ſet backward a Day, according to the foregoing Rules and Directions for that Purpoſe, they will continue to ſhew us the New or the Full Moons of the Church of *Rome* or the *Gregorian* Calendar with great Exactneſs, till the Year 4199: when, as has been already mentioned, there muſt be a little Variation made in thoſe Rules and Directions.

There is however one Exception to thoſe General Rules and Directions, which will be taken notice of in the next Paragraph.

Upon theſe Principles I framed the Table accompanying this Paper, and ſhewing, by means of the Golden Numbers, all the *Gregorian* Paſchal Limits or Full Moons, from the Reformation of the Calendar, *&c.* by Pope *Gregory* to the Year 4199 incluſive. Which Space of Time is therein divided into ſixteen unequal Portions or Periods; at the Beginning of

each of which, all the Golden Numbers, when once they ſhall have been properly placed in the Calendar, muſt either be advanced or ſet back one Day, with reſpect to the Place where they ſtood in the preceding Period, agreeably to the foregoing Rules: Except thoſe Numbers which ſhall happen to ſtand againſt the 4th and 5th of *April* to ſhew the Paſchal New Moons, or againſt the 17th and 18th of the ſame Month to mark out the Paſchal Full Moons; both which Numbers at ſome Times, and only one of them at others, muſt keep the ſame Place for that, which was allotted to them in the immediately preceding Period.

In order to determine at what Times, and on what Occaſions, this Exception is to take Place; let it be obſerved, that, in the Months of *January*, *March*, *May*, and ſome others in our preſent Calendar, as well as in the Table above-mentioned, ſome of the Golden Numbers ſtand double or in Pairs, and follow one the other immediately; whilſt others, on the contrary, generally ſtand ſingle and by themſelves.

Now, when any of thoſe Pairs, or two Numbers which uſually accompany each other, happen, in purſuance of the foregoing Rules, to be prefixed the one to the 4th and the other to the 5th of *April* for the New Moons, or the one to the 17th and the other to the 18th of *April* for the Paſchal Limits or Full Moons: And when any of thoſe Numbers, which generally ſtand ſingle, are prefixed, according to the ſaid Rules, to the 5th of *April* for the New Moons, or to the 18th for the Full Moons: In theſe Caſes thoſe Pairs or ſingle Numbers that are ſo ſituated, muſt not be ſet forward or advanced at the Beginning

ning of the next Period, but muſt keep their Places during another Period, if the foregoing Rules direct all the Golden Numbers to be advanced a Day; which muſt be complied with in reſpect to all the other Golden Numbers, except thoſe ſo ſituated as above. Inſtances whereof may be ſeen in the Table, under the reſpective Periods beginning with the Years 1900, 2600, 3100, and 3800.

But if, in Conformity to the foregoing Rules, all the Golden Numbers are to be ſet one Day backward; thoſe Pairs or ſingle Numbers, tho' ſituated as is above-mentioned, muſt not keep their Places, but muſt move one Day backward like all the other Golden Numbers; as they may be ſeen to do in the Periods beginning with the Years 2400 and 3600.

To give a plain and intelligible Account of the Reaſon, on which the Directions now given with reſpect to this Exception are founded, would extend this Paper, already too long, far beyond its due and proper Bounds. I ſhall therefore content myſelf with obſerving, that it depends chiefly upon the Nature of the *Menſes Pleni* and *Menſes Cavi*, into which the Lunar Year is uſually divided: and that, in order to make uſe of the Golden Numbers for finding the Time of the *Gregorian Eaſter*, it will be neceſſary not only to conform to the general Rules laid down in the former Part of this Paper; but alſo to follow the Directions juſt now given, with reſpect to the above-mentioned Exception to thoſe general Rules.

But I ſhould not do Juſtice to *Peter Davall*, of the *Middle Temple*, Eſq; Secretary of the *Royal Society*,

Society, did I not here acknowledge, that, before I had ſo fully conſidered theſe Matters as I have ſince done, I had the firſt Hint of applying the Golden Numbers to find the *Gregorian* Paſchal Limit or full Moon, from him; who has ſince that time compoſed and drawn up Tables, *&c.* which may poſſibly be of conſiderable and general Uſe in this Nation hereafter.

VI.

A TABLE, shewing, by means of the Golden Numbers, the several Days on which the Paschal Limits or Full Moons, according to the *Gregorian* Account, have already happened, or will hereafter happen; from the Reformation of the Calendar in the Year of our Lord 1582, to the Year 4199 inclusive.

To find the Day on which the Paschal Limit or Full Moon falls in any given Year; Look, in the Column of Golden Numbers belonging to that Period of Time wherein the given Year is contained, for the Golden Number of that Year; over-against which, in the same Line continued to the Column intitled *Paschal Full Moons*, you will find the Day of the Month, on which the Paschal Limit or Full Moon happens in that Year. And the *Sunday* next after that Day is *Easter* Day in that Year, according to the *Gregorian* Account.

Golden Numbers from the Year 1583 to 1699, and so on to 4199, all inclusive.

1583 to 1699	1700 to 1899	1900 to 2199	2200 to 2299	2300 to 2399	2400 to 2499	2500 to 2599	2600 to 2899	2900 to 3099	3100 to 3399	3400 to 3499	3500 to 3599	3600 to 3699	3700 to 3799	3800 to 4099	4100 to 4199
3	14	..	6	17	6	17	..	9	..	1	12	1	12	..	4
..	3	14	..	6	..	6	17	..	9	..	1	..	1	12	..
11	..	3	14	..	14	..	6	17	..	9	..	9	..	1	12
..	11	..	3	14	3	14	..	6	17	..	9	..	9	..	1
19	..	11	..	3	..	3	14	..	6	17	..	17	..	9	..
8	19	..	11	..	11	..	3	14	..	6	17	6	17	..	9
..	8	19	..	11	..	11	..	3	14	..	6	..	6	17	..
16	..	8	19	..	19	..	11	..	3	14	..	14	..	6	17
5	16	..	8	19	8	19	..	11	..	3	14	3	14	..	6
..	5	16	..	8	..	8	19	..	11	..	3	..	3	14	..
13	..	5	16	..	16	..	8	19	..	11	..	11	..	3	14
2	13	..	5	16	5	16	..	8	19	..	11	..	11	..	3
..	2	13	..	5	..	5	16	..	8	19	..	19	..	11	..
10	..	2	13	..	13	..	5	16	..	8	19	8	19	..	11
..	10	..	2	13	2	13	..	5	16	..	8	..	8	19	..
18	..	10	..	2	..	2	13	..	5	16	..	16	..	8	19
7	18	..	10	..	10	..	2	13	..	5	16	5	16	..	8
..	7	18	..	10	..	10	..	2	13	..	5	..	5	16	..
15	..	7	18	..	18	..	10	..	2	13	..	13	..	5	16
4	15	..	7	18	7	18	..	10	..	2	13	2	13	..	5
..	4	15	..	7	..	7	18	..	10	..	2	..	2	13	..
12	..	4	15	..	15	..	7	18	..	10	..	10	..	2	13
1	12	..	4	15	4	15	..	7	18	..	10	..	10	..	2
..	1	12	..	4	..	4	15	..	7	18	..	18	..	10	..
9	..	1	12	..	12	..	4	15	..	7	18	7	18	..	10
..	9	..	1	12	1	12	..	4	15	..	7	..	7	18	..
17	..	9	..	1	..	1	12	..	4	15	..	15	..	7	18
6	17	17	9	..	9	..	1	12	12	4	15	4	15	15	..
14	6	6	17	9	17	9	9	1	1	12	4	12	4	4	15

Paschal Full Moons. Days of the Month, and Sunday Letters
March 23. C
.. 22. D
.. 23. E
.. 24. F
.. 25. G
.. 26. A
.. 27. B
.. 28. C
.. 29. D
.. 30. E
.. 31. F
April 1. G
.. 2. A
.. 3. B
.. 4. C
.. 5. D
.. 6. E
.. 7. F
.. 8. G
.. 9. A
.. 10. B
.. 11. C
.. 12. D
.. 13. E
.. 14. F
.. 15. G
.. 16. A
.. 17. B
.. 18. C
.. 19. D
.. 20. E
.. 21. F
.. 22. G
.. 23. A
.. 24. B
.. 25. C

VI. *An Account of the* Morbus Strangulatorius, *communicated in a Letter from* John Starr, *M. D. to* C. Mortimer, *M. D. Secret. R. S.* &c.

SIR, *Liskard*, Jan. 10. 1749.

Read May 24. 1750.

IT is not, I'll aſſure you, an Itch for Scribbling, but the Concern I feel in my own Breaſt for the Happineſs and Well-being of my Fellow-Creatures, which has occaſioned my ſending you the Papers, which this accompanies. We have had ravaging among us for ſome time, at certain Seaſons, a Diſeaſe formidable in its Advances, and fatal in its Conſequences, I mean an occult *Angina*, called with ſome Propriety *Morbus Strangulatorius*. Dr. *Fothergil*'s ſore Throat with Ulcers, and Dr. *Cotton*'s St. *Alban*'s ſcarlet Fever, *&c.* are in my Opinion but its Shadows. None practiſing in thoſe Parts have reaſon to boaſt their Succeſs in attempting its Cure. The Way to cure Diſorders is firſt to know them. Where the Deviations of Nature are hidden, where we cannot diſcern how and in what manner the diſtreſſed Functions ſuffer, the Art of Healing muſt have its Difficulties. The ſudden, and indeed unexpected Death of ſome Patients greatly alarmed me. I concluded the Cauſe deeper than at firſt imagined. The Caſe herewith ſent, confirms my Conjecture. It is extraordinary and uncommon. Does medical Hiſtory afford its like? It is poſſible it may, but it has not yet fallen within the Compaſs of

my Reading, or Study. *Tulpius's* Obſervation, *Lib.* iv. *Cap.* ix. falls vaſtly ſhort of it.

The Figures (*ſee* TAB. I. *Fig* 1. 2.) I. have ſent in order to give you clear and juſt Ideas of the Caſe, are drawn with great Truth and Exactneſs. Should Vouchers be neceſſary for a Confirmation of the Fact, I can ſend you many. But I am ſatisfied Dr. *Mortimer* will ſcarce think me capable of attempting an Impoſition on Mankind in ſo important an Affair.

I have been, I own, ſomewhat prolix: If you think the Whole, or any Part, worthy Publication, you are at Liberty to treat it in the Manner that is moſt agreeable. I ſhould be glad from the Premiſes to ſee a rational Method of attempting a Cure pointed out. I pleaſe myſelf with believing you have not quite forgot me, when I add, that I am, with great Regard,

SIR,

Your moſt humble Servant,

JOHN STARR.

THE *Morbus Strangulatorius*, with great Propriety and Juſtice thus denominated, has within a few Years reigned in ſeveral Parts of *Cornwal* with great Severity. Many Pariſhes have felt its Cruelty, and whole Families of Children, whence its contagious Nature is but too evident, have, by its ſucceſſive Attacks, been ſwept off. Few, very few, have eſcaped.

I do not propoſe to ſend you an accurate Hiſtory of this Diſorder. This I chearfully leave to ſuch Gentlemen as have been more converſant in Practice among us, and whoſe Penetration, and Judgment, are

are undoubtedly far ſuperior to mine. However, as the Obſervations theſe Papers contain are in themſelves juſt, honeſtly, and truly, tho' with great Plainneſs and Simplicity, related, ſo they are not perhaps unworthy the Knowledge of the Public, and Conſideration of even the greateſt in the Profeſſion.

It is enough to ſay, that the Diſorder does not appear with the ſame Train of Symptoms in every Subject. On the contrary, a vaſt Difference is obſervable; but then, whatever, or how various ſoever, the Symptoms may be, there is a certain Degree of Malignity, or (which is what I mean) there are Signs of a putrid Diſpoſition of the Juices, in all.

Some, I am informed, have had corroſive Puſtules in the Groin, and about the *Anus*, eating quick and deep, and threatening Mortification, even in the Beginning. Others after a few Days Illneſs have had Numbers of the worſt and deepeſt *Petechiæ* break out in various Parts of their Body. Such I have not ſeen.

Many on the firſt Attack have complained of Swellings of the Glands, as Tonſils, Parotids, ſubmaxillary and ſublingual Glands, but frequently of no great Importance. A few, from an internal Tumor, have had a large external oedematous Swelling of the ſubcutaneous and cellular Tunic, from the Chin down to the Thyroïd Gland, and up the Side of the Face. One ſuch I was concerned with, the Tumor broke in the *Fauces*; but, inſtead of a laudable Pus, ſome Ounces of a Coffee-coloured exceedingly fetid Matter were ſpit off. The Man recovered. As Reſpiration only ſuffered here by

Preſſure, I ſhould rather chooſe to call this a malignant *Angina*, than the true *Morbus Strangulatorius*.

Not a few early in the Diſorder have had gangrenous Sloughs formed in their Mouths, and perhaps ſo early in ſome, that the Diſorder was ſcarce complained of, till the Slough was formed, ſo quick has it been in its Progreſs.

Others again, without any of the preceding Symptoms, have only complained of a ſlight Pain in ſwallowing, ſucceeded with a hot Fleſh, feveriſh Pulſe (never quick and weak, but as to the Stroke quick, and ſufficiently full and ſtrong), a ſhort, low, hecking, hoarſe Cough (the Patient generally ſo hoarſe as to be difficultly underſtood after a Day or two's Illneſs), which, ſooner or later, for I never could obſerve any certain Period, was productive of a difficult, noiſy, and ſtrangulating Reſpiration.

Theſe Laſt, eſpecially the Former of them, I eſteem as the pathognomonic Symptoms of the real *Morbus Strangulatorious:* The above-mentioned are rather *Symptomata Cauſæ, quam Morbi.*

I have not mentioned a *Fœtor Oris*, which, when it happens, is uſually an early Symptom, becauſe, tho' ſome have had it, others have had it not.

This Reſpiration, however agonizing it appears, has, eſpecially in the Beginning, its Remiſſions, and Exacerbations. Its Cauſe cannot of courſe be permanent. I take it to be owing to a Lodgment of ſome Matter in or about the *Glottis*, and *Larynx* thro' which the inſpired Air is obliged to paſs: While this Matter is capable of being expectorated, and happens to be coughed off, the Breathing for a time becomes free, and the Patient is delivered from the utmoſt

utmoſt ſeeming Diſtreſs; but, on its Recollection, which, if the Progreſs of the Diſorder cannot be ſtopt, never fails to happen, this Symptom again occurs, and the Patient either dies ſuddenly, or, being worn out, or quite diſpirited, ſinks away gradually, or, falling into Convulſions, in theſe expires.

I was called to a Girl of five Years old. Her Tongue was quite clean; ſhe could move it every way as in Health. Nothing morbid was ſeen in her Mouth, or indeed *Fauces*: She had a trifling Pain in ſwallowing (it was felt on depreſſing the *Epiglottis* for the paſſing the Bole), not ſufficient to prevent her from eating Bread and Butter, Biſcuit, Figs. It was on the 4th Day of her Diſorder, ſhe had the ſtrangulating Reſpiration, with a Cough exceeding hoarſe. After the Uſe of a ſtimulating Gargle, *&c.* her Cough became ſtronger, and ſhe threw off a large Quantity of white rotten Fleſh, or Membranes, mixt with a ſlimy adheſive Matter; her Reſpiration became ſo eaſy, that ſhe ſeemed to ail nothing. In three Hours it grew again difficult, and gradually increaſed till it arrived at its former Violence. Thoſe about her fanſied there was ſomewhat in the Paſſage which ought to come off: The Child gargled, and provoked her Cough as far as ſhe was able, but in vain. Her Agonies increaſing, ſhe ſaid, as well as ſhe was able, I ſhall be choaked, and in a few Minutes died. This Caſe ſhocked me, being ſatisfied, that ſomewhat very extraordinary and uncommon could only occaſion ſo ſudden, and to Appearance, violent a Death.

I have frequently examined the Matter thoſe Patients have at times ſpit. Tho' there was ſome

Difference

Difference in various Subjects, yet I never once ſaw a well-digeſted or concocted Phlegm, or *Mucus*, on the contrary, the greateſt Part was of a Jelly-like Nature, glary, and ſomewhat tranſparent, mixt with a white opaque thready Matter, ſometimes more, ſometimes leſs, reſembling a rotten membranous Body or Slough.

Such a Slough I have ſeen generated on the Skin of one of theſe Patients in the Neck and Arm, where Bliſters had been before applied. The Bliſters had been dreſſed with Colewort-leaves, and ran but little; but, contiguous to them, ſmall red Puſtules, not exceeding fiery, aroſe, which, ſweating plentifully in a few Hours, became quite white: Theſe, hourly enlarging their Baſes, united, and covered a large Surface, freſh Puſtules ariſing in the adjacent Parts. This white Surface had the Aſpect of an overſoaked Membrane, which, being overſoaked, was become abſolutely rotten. The Part bliſtered, if not quite, was in Effect dry, and the Flux from the Slough was incredibly great. If I miſtake not, Cloths ten times double, the Child's Shift, a double Bed-gown, were wet quite through, and a large Spot was ſeen in the Bed of ſome Hands Breadth; and this in a very few Hours. I ſcratched the Slough with my Nail; it ſeparated with Eaſe, and without being felt by the Child. What my Nail took off afforded the ſame Appearance with the Matter of the Spittle before-mention'd. Hence, I thought, I ſaw ſufficient Reaſon to convince me that the Diſorder in the *Larynx* and *Aſpera Arteria* was ſimilar to this, generated in the ſame manner, and ariſing from the ſame internal Cauſe: And ſuppoſing this Conjecture true, the

Production

Production of every Symptom ſeems eaſy to be accounted for.

In *Dec.* 1748, while the *Morbus Strangulatorius* was among us at *Liskard*, a Child here and there had red Puſtules, not unlike the above, which broke out in the Nape of the Neck, and threw off a ſurpriſing Quantity of thin tranſparent Ichor, vaſtly glutinous when dry. Theſe were eaſily cur'd in the Beginning, if managed aright; but, being drawn with Colewort-leaves, or pultiſed according to the Direction of our old Female Practitioners (too often the Caſe) the above-mention'd Slough was ſoon generated. I was deſired to look on a poor Perſon's Child in this unhappy Situation, who, with little Intermiſſion for I think near two Days, had bled profuſely at the Noſe; her Pulſe was almoſt gone; the Bleeding was with Difficulty ſtopt; but, being quite exhauſted, in about 6 Hours ſhe ſunk in a faint Fit. The Slough had ſpread from Shoulder to Shoulder, extended full a Third down her Back, and ſeem'd very thick. All treated in the above Manner died. Scarifying afforded no Relief.

Now, tho' this was not properly the *Morbus Strangulatorius*, yet I apprehend it was analogous to it, and produced from the ſame Cauſe; and it is likely, had the anatomical Knife been employed, what was ſeen on the Back of one, might have been diſcover'd in the *Aſperia Arteria* of the other. There is a Circumſtance which adds to the Probability of this Opinion, *viz.* in one or more Inſtances, theſe different Diſorders appear'd in different Subjects, in the ſame Family, at the ſame time.

What

What I have hitherto ſaid, does not, I own, demonſtrate the Caſe to be as repreſented, but the following Hiſtory throws the ſtrongeſt Light on this dark, myſterious Affair, renders the Diſorder, by its Conſequences affrightful, even ſhocking to the Imagination, accounts for its too common Fatality, and muſt convince of the great Difficulty of the Cure, if in itſelf poſſible, unleſs attempted with Judgment in the very Beginning.

Dec. 11, 1749, I was call'd to the Son of Mr. *Kitto*, an honeſt and deſerving Farmer in the Pariſh of *St. Eve*, a Lad aged 10 Years and an half. This was the 7th Day of his Illneſs.

His firſt Complaints were, a Pain in ſwallowing, not great; a Cough, hoarſe, vexatious, like an incipient Catarrh, a Pain on coughing ſhot into his Ears. This was ſtill felt at times; a thin Ichor ran from his Mouth in great Plenty, ſuppoſed to be a Quart, or three Pints daily. His Pain in ſwallowing was now ſo trifling, that I ſaw him drink a conſiderable Draught without removing the Veſſel. He was now ſo hoarſe that he could ſcarce be heard. His Cough was rough, low, ſhort, and ineffectual; breath'd with much Straitneſs and Noiſe, eſpecially in Inſpiration; the Wheezing or Rattling might be heard at a great Diſtance, was always worſe during a coughing Fit, or for a ſhort time after. When he ſpit by the Cough, it was glary, but glutinous; a whitiſh rotten ſort of Stuff would ſometimes accompany it; its Quantity never great.

Examining his Mouth, he could move his Tongue every Way without the leaſt Pain; forward it was clean, but behind a little furr'd. Depreſſing it with

a

a *Spatula*, a white Body was ſeen on the *Velum pendulum palatinum* and Tonſils. I deſired Mr. *Scotchburn*, a Surgeon preſent, to examine with his *Forceps*, if this Body adher'd firmly to the *Velum*, or was looſe; on Trial he found it ſtrongly adher'd. The Lad complain'd of no Pain on his taking hold of it. The circumambient Parts of a ſomewhat deeper Red than natural; his Breath ſtinking, and highly offenſive.

He was but little thirſty; Pulſe quick, but ſufficiently ſtrong; ſlept but little; what Sleep he had was diſturb'd; he breath'd much better up than in Bed; here he was always in Danger of Suffocation, and fear'd it.

After pronouncing a Prognoſtic diſagreeable to myſelf, and all concerned, I order'd the Slough, as I then thought it, to be well rubb'd once in three Hours with a Mixture acuated with *Spir. Sal. marin.* by means of a Silver Probe arm'd with Cotton, after which an aſtringent, detergent, antiſeptic Gargle was to be frequently us'd, and a cordial Mixture to be taken at proper Intervals.

After rubbing with the Probe, *&c.* twice, and gargling often, in a violent Fit of Coughing with a deal of ſlimy filthy Stuff from the Pipe of the Lungs, the Membrane (Tab. I, *Fig.* 1.) ſeparated from the *Velum Palatinum*.

It was really the external and mucous Coat of the Part, was not rotten like a Slough, but retain'd, tho' dead, its membranous Structure, was ſtrong, would bear handling, and ſtretching without breaking. It was at firſt thick (as near as I could gueſs from a Bit remaining on the right Side of the *Uvula* parted

from the Hollow (*a*) in the Figure, of about the Third of a Barley-corn in Length) having its Fibres and Cavities ſoak'd with a very viſcid and ſlimy Matter, which, by waſhing in Water, leak'd off, when the Membrane became evidently thinner.

The Lad immediately, as I was told, breath'd better, without that Noiſe and Wheezing heard before, and was leſs hoarſe; not, I am ſatisfied, from the Separation of the Membrane, but from that Load of Filth diſcharg'd at the ſame Point of Time from the diſtreſs'd reſpiratory Paſſages.

But, as uſual, this Relief did not prove laſting. In an Hour and half the noiſy Reſpiration began anew, his Hoarſeneſs increaſed, and his Cough, tho' ſhort and low, was buſy and vexatious; now he appear'd as if quite ſtrangled, and in the Agonies of Death; now he would again revive; for a few Days he was interchangeably in theſe different States; at length his Father perceiving ſomewhat in his Mouth, which he thought thick Phlegm, thruſt in his Finger and Thumb, and, taking hold of it, drew it out. It was a hollow Bag, as he thought, filled with Rot and Corruption, for a conſiderable Quantity run out of it. It was, when full, he ſaid, as big as his Thumb, and of many Inches in Length. The Agonies of the Child, during theſe Moments, were not to be expreſs'd; his Face was livid or black; but, being freed from this Burthen, he ſoon reviv'd, ſmil'd, and ſaid, now I am eaſy. Being put to Bed, he ſoon ſlept, and continued to have ſhort Naps for two Hours.

I got to the Houſe, being ſent for in the Beginning of the Lad's Extremity, a few Minutes after the Affair was thus concluded. The Account greatly ſurpriſed

priſed me; but I was more ſurpriſed, when, on Sight, I found the ſuppoſed Bag was the mucous Coat of Part of the *Larynx*, the whole *Aſpera Arteria*, with the grand Diviſion of the bronchial Ramifications. I ſpread it on Paper, for the Conveniency of Carriage, being ſome Miles from home, and thence took its Likeneſs with great Exactneſs, as here ſent you, TAB. I. *Fig.* 2. There was ſomewhat bloody viſible about its Middle. It was more rotten and tender than the former, alſo ſomewhat thicker, excepting where it belonged to the Branches of the *Bronchia*. What ſweated from it was as ſticking as Bird-lime. It was probable this morbid Affection ran thro' the whole *Bronchia*; for the Ends plainly diſcover'd a Laceration; conſequently much more remain'd to be ſeparated and diſcharg'd.

He now complain'd of Soreneſs in the Pipe, and pointed to the firſt and ſecond *Coſta*, as the Place of its Termination. His Inſpiration was now free, ſoft, but ſhort: His Pulſe was become a little more frequent and weaker.

Examining his Mouth, no Ulcer or Wound was diſcernible in that Part of the *Velum, &c.* to which *Fig.* 1. adher'd. 'Twas ſmooth, clean, and look'd only like a new Skin not quite harden'd.

While I was in the Houſe, he ſpit off another Membrane of an irregular Figure, thinner than either of the former, but more than ſufficient to cover a Crown-Piece. It came from the *Fauces*.

After this I was inform'd he brought off with Difficulty another tubular Membrane of ſome Length; and whenever he had Strength to expectorate, little

Bits of the ſame were obſerved mix'd with a very ſlimy *Mucus*.

He liv'd 21 Hours after the ſecond Coat was drawn from him, and died in the End ſomewhat ſuddenly, tho' in his perfect Senſes. I muſt add, that I never ſaw one in this Diſorder attack'd with a *Delirium*.

VII. *An Examination of the Strength of ſeveral of the* principal purging Waters, *eſpecially of that of* Jeſſop's Well; *by the Rev.* Stephen Hales *D. D. & F. R. S. communicated in a Letter to* Cromwell Mortimer *M. D. Secr. R. S. with a Letter from* Swithin Adee *M. D. F. R. S. to Dr.* Hales, *on the Virtues of the ſaid* Well.

An Account of the ſeveral Quantities of Sediment *which were found in a Pound Averdupois of the following* purging Waters, *evaporated away to Dryneſs, in* Florence *Flasks, cut to a wide Mouth*; viz.

Read May 24. 1750.

		Grains
1.	*Marybon-Fields* near *London*	24
2.	*Peterſtr. Brew-houſe Weſtm.*	27
3.	*Ebſham*	34
4.	*Scarborough*,	40

And it was found nearly the ſame by Dr. *Shaw* and Dr. *Short*: A little more or leſs, according

Grains

according to the Wetneſs or Dryneſs of the Seaſons $\frac{1}{3 \cdot 2}$ of this in calcarious Matter; the reſt, moſtly what is called nitrous Salts, on account of the oblong Chryſtals which it ſhoots into.

5. *Dog* and *Duck*, *Lambeth* - - 40½
6. *Kilburn*, four Miles from *London*, in the Way to *Edgwar* - - - 43
7. *Acton* - - - - - 44
8. *Cheltenham*, *Glouceſterſhire*, - - 60

Dr. *Short* found the following Proportions in *Cheltenham* Water; *viz.*

Sept. 1738. calcarious Sediment $\frac{1}{10 \cdot 6}$ of 74
Dec. 1738. - - - - $\frac{1}{14}$ of 42
July 1739. - - - - $\frac{1}{9 \cdot 8}$ of 70

He ſays it is the beſt and ſtrongeſt nitro-calcarious Water in *England*, very bitter, having only a little ſubtil impalpable Earth mixed with its Salt.

9. *Cobham Well*, a Mile South of *Church Cobham*, *Surrey*, once 68 Grains, another time 60 Grains - - - - 68
10. *Jeſſop's Well*, on *Stoke Common*, in Mr. *Vincent's* Manor, about three Miles Southward of *Claremont*, *Surrey*, *Sept.* 11, 1749. after long dry Weather, 82 Grains in a Pound of the Surface-Water - - - 82

October 16, after a conſiderable Quantity of Rain, the Surface-Water yielded but 60 Grains *Nov.* 21, the Surface-Water yielded 65 Grains.

This great Inequality of the Strength of the Surface-Water put me upon trying whether the Water at the Bottom of the Well, near the Springs, were ſtronger than the Surface-Water. And in order to this, I procured, *Dec.* 11, a Bottle of the Water near the Bottom, which was ten Feet below the Surface of the Water; which was done by tying an empty Bottle to the End of a long Pole, with a Line fixed to the Cork, to pull it out when at the Bottom, for the Water to fill it: And I had at the ſame time another Bottle full of the Surface-Water. The lower Water yielded 82 Grains; the Surface-Water but 48 Grains; and it was the ſame upon a ſecond Evaporation of thoſe Waters. Hence we ſee how much ſtronger the Water near the Bottom is, than at the Surface; even when the preceding Rains have been but moderate; for they had not as yet been ſufficient to raiſe the Springs in this Country much. Hence we ſee that the ſtronger lower Water may eaſily be come at by means of a Pump; as alſo, that the upper Land-Springs, ſoon after Rains, make the Water near the Surface weaker: But, in long dry Weather, when there are no Land-Springs, the Surface-Water, and that at the Bottom, are nearly of an equal Strength: For it requires Time for the ſaline mineral Virtue to be equally diffuſed thro' a Maſs of that Depth of Water, whoſe upper Part is inceſſantly weakened by a Land-Spring of freſh Water.

Hence we ſee how adviſeable it is, in order to keep out the Land-Springs, to dig a narrow Trench ſome Feet Depth, round the Well, to be filled with ſtiff Clay well rammed.

The

The mineral Virtue in this Water ſeems to be much like that of *Cheltenham*, in its ſhooting into very bitter, regular, oblong Chryſtals, which are, on that account, called nitrous; tho' they are not a true Nitre; for neither theſe, nor thoſe of *Cheltenham*, will deflagrate or flaſh in Touch-Paper, nor on burning Charcoal, as true Nitre will do; ſome of which ſtill retain their Form and Firmneſs for 17 Months ſince they were chryſtallized; whereas the chryſtallized Salts of ſeveral other purging Waters have crumbled, and in a great meaſure waſted, away in much leſs Time: A greater Proportion of the Salts of *Jeſſop's Well*, ſhoot into oblong Chryſtals than thoſe of *Cheltenham*; and its Water alſo gives a ſtronger green Tincture, with Violet-flowers. The purging Quality reſides chiefly in theſe chryſtalline Salts, and a ſmall Proportion of common Salt; ſome of which there is in all theſe mineral Waters.

The Proportion alſo of its earthy calcarious Matter, is but $\frac{1}{11\frac{1}{4}}$ Part of it; which, like that of *Cheltenham*, is but little, in compariſon of the much greater Quantity of it in other purging Waters: It is alſo ſoft and impalpable, like that of *Cheltenham*, and not harſh and coarſe, as it is in ſome other purging Waters.

And as the Quantity of purging Salt in this Water is conſiderably greater than in any other, ſo it is found by Experience, that, proportionably a leſs Quantity of it ſuffices, which makes it ſit the better on the Stomach. It is alſo obſerved to exhilarate thoſe who take it.

It was obſervable of the Sediment of ſeveral of theſe Waters, that, when dried, and while hot, there

there aſcended Plenty of inviſible volatile ſalt Fumes, ſo pungent that the Noſe could not bear them. Hence we may reaſonably conclude, that the Waters which abound moſt with purging Salts, ſuch as thoſe of *Jeſſop's Well*, ſhould be proportionably preferable to weaker Waters, which are ſtrengthened by boiling half away; whereby not only the more ſubtil active Parts are evaporated; and thoſe that are left are decompounded, and formed into new groſſer Combinations; as are alſo the calcarious Particles, which are ſo fine as to paſs the Filter before Evaporation, but not after it. This was the Reaſon which induced me to examine, by various repeated Trials, and to give an Account of the ſuperior Strength of *Jeſſop's Well* Water, above all others that I have examined or heard of.

When *Jeſſop's Well* was cleaned, *Oct.* 16, 1749. after a conſiderable Quantity of Rain, after about half a Foot Depth of black muddy Filth was taken out, then the natural fat ſandy-colour'd Clay-Bottom appear'd; thro' ſeveral Parts of which the Water ouzed up at the Rate of 160 Gallons in 24 Hours.

The Water which then came freſh from the Spring gave a weak Bluſh with Galls; but when put into Bottles it did not do ſo next Day; a Sign that there is ſome Degree of Steel in it.

It was very obſervable, that the Man who ſtood about three Hours bare-legg'd in this Well-Water to clean it, was purged ſo ſeverely for a Week, that he ſaid he would not venture, on any account, thus to clean the Well again. And it was the ſame with another Man, who cleaned the ſame Well about twelve Years ſince. And I am credibly informed by

by a Merchant, that, being in a Warehouſe in *Ægypt* to ſee *Senna* baled up, it had the like purgative Effect on him.

In order to get a ſatisfactory Account of the Efficacy of theſe Waters, I deſired Dr. *Adee* of *Guilford*, who has long preſcribed them to his Patients, to give me his Opinion of them; which he has done in the following Letter; *viz.*

SIR, *Guilford, March* 14, 1749.

I HAVE found very advantageous and uncommon Effects from the Uſe of the Waters of *Jeſſop's Well.* Some of my Patients who have drank them ſteadily and cautiouſly have been cur'd of obſtinate Scurvies. As I had a long time ago Reaſon to think there was a fine volatile Spirit in them, I therefore oblig'd ſome to drink them for a Courſe of Time at the Well as an Alterative, with very happy Conſequences. When I have order'd them as a Purge, they have work'd very ſmartly, but have not diſpirited. I am glad to have it in my Power to confirm your Sentiments by my own Obſervations; and am ſatisfied theſe Waters, if continued a proper Time, and taken in a proper Manner, may be render'd very beneficial to Mankind, according to the beſt Opinion that can be formed by

SIR,

Your moſt faithful humble Servant,

Swithin Adee.

VIII. *An abſtract of a Diſcourſe intitled,* Reflexions on the Medals of *Peſcennius Niger*, and upon ſome Circumſtances in the hiſtory of his Life; *writen in French by* Mr. Claude Gros de Boze, *keeper of the Medals in the French King's Cabinet*, etc. *and ſent by him to Dr.* Mead, *who communicated it to this Society. By* John Ward, R. P. G. *and* F. R. S.

Read May 31, 1750. THE learned Author begins his Diſcourſe with obſerving, that no medals of the Roman emperors, who reigned during the high empire, are more rare, than thoſe of *Peſcennius Niger*; that they are ſomewhat ſcarcer in ſilver, than in braſs; and that it is the general opinion of antiquaries, there is not one extant in gold.

And tho *Anthony le Pois*, who lived about the middle of the ſixteenth century, affirms in his poſthumous book of *Antient medals* (1), that he had a *Peſcennius* in gold, and alſo ſome other perſons: yet he thinks, that as it is not known what became of thoſe medals, they were counterfeits; of which ſort he has ſeen ſeveral, which being caſt from ſilver ones of that emperor, were afterwards repaired more or leſs artfully with a graver. He is likewiſe of the ſame opinion with regard to thoſe, which have been collected by *Mediobarb* from other catalogues; ſince Mr.

(1) *Diſcours ſur les Medailles antiques, etc. Paris.* 1579. *qu.*

Mr. *Vaillant*, the moſt knowing and experienced antiquary of the laſt age, in treating of the medals of this emperor ſais expreſsly, *ex auro non obſervantur* (1); and Mr. *de la Baſtie* has alſo remarked in his *Catalogue of the Roman emperors*, that notwithſtanding what is ſaid by *Anthony le Pois*, no medal of *Peſcennius Niger* in gold is to be found in any known cabinet (2).

Sigiſmond Liébe, who in the year 1730 publiſhed the cabinet of the Duke of *Saxe Gotha*, under the title of *Gotha Numaria*, in order to prove it ſuperior to that of the Duke of *Parma* publiſhed by Father *Pedruſi* (3), and equal at leaſt to that of the antient Dukes of *Arſchot* (4); has ranged the gold imperial medals of thoſe three cabinets in three oppoſite columns: and when he comes to *Peſcennius Niger*, he firſt remarks, that there is no gold medal of him in the cabinet of *Parma*; and then ſais, that the ingraved one in the *Arſchot* collection is generally acknowledged to be counterfeit and caſt. He likewiſe declares his agreement with all other antiquaries, that there is no true one in gold; but, in order to render the compariſon more complete, he has ventured to place a falſe one of *Saxe Gotha* againſt that of *Arſchot*, becauſe it was one of the firſt in the collection, and not diſapproved of by Mr. *Morel* (5).

But

(1) *Numiſmat. Imp. Rom. praeſtantior.*
(2) *La ſcience des Medailles, Tom.* II. *p.* 398. *ed.* 1739.
(3) See *Bandur. Bibl. Numar. p.* CVII.
(4) *Ibid. p.* XXXVII.
(5) *Goth. Num. cap.* III. § 2. *p.* 49.

But notwithſtanding this prevailing opinion Mr. *de Boze* ſais, that for upwards of thirty years, in which he has had the keeping of the King's medals, he has not ceaſed to inquire after a *Peſcennius* in gold, as thinking it not impoſſible, but one might be found. Becauſe, when a prince or general was proclaimed emperor, the firſt proof he gave of his authority, was to order gold or ſilver money to be ſtruck as his coin in his own palace; the conſent of the ſenate being only neceſſary for Latin braſs coins, which were current at *Rome*, and required the uſual ſignature S. C. for *Senatus conſulto*.

In the years 1726 and 1727 he received accounts, as he ſais, of one and the ſame gold medal of *Peſcennius*, as brought from four different quarters; firſt from *Spain*, then from *Sicily*, afterwards from *Malta*, and laſtly from *England*. But he found it to be falſe, as all others had done, who had ſeen it. It had been caſt from a ſilver one of that prince, on the reverſe of which is the figure of the godeſs *Hope*; with the inſcription of BONAE SPEI, which is the moſt common of any. Thoſe in the cabinets of *Arſchot* and *Saxe Gotha* have likewiſe the ſame reverſe, and doubtleſs from the ſame origin.

About ten yeats afterwards a learned Engliſhman, who came from *Montpellier*, informed Mr. *de Boze*, that he had ſeen in a ſmall collection of one Mr. *Veiſſiéres*, counſellor of the *Court of Aids*, two coins of *Peſcennius* in gold; one of which was manifeſtly falſe, and the other deſerved to be examined. Upon this information he applied himſelf to an eminent connoiſſeur (1), who viewed the two medals, as far as

(1) *M. Bon, Prémier Preſident de la chambre des comptes, etc.*

as the delicacy of the owner would permit him; for he would not ſuffer them to be touched, as fearing leſt ſome damage might inſue from too near an inſpection. However the Gentleman acquainted him, that they were both equally falſe; one being rough caſt from a ſilver one, and the other carefully repaired, ſo as to give it ſome appearance of a genuine coin, when compared with the former, which it would not have, if viewed by itſelf: that the reverſe was BONAE SPEI: and that ſuch as they were, the owner would not part with them upon any conſideration. But upon the death of Mr. *Veiſſiéres* the examination of thoſe medals became more eaſy, and ſerved only to confirm the judgement given of them; and the intire collection was ſold for little more than the weight.

At length, in the month of July 1748, Mr. *de Boze* had freſh incouragement to purſue his inquiry; which he did with greater attention, and better ſucceſs, than before. A barefooted *Carmelite* of the convent of *Paris* ſhewed him a letter, which he had received from one of his own order at *Marſeilles*, who lately arrived from the *Levant* (1), where he had been imployed as a miſſionary. His correſpondent acquainted him, that he had a gold medal of *Peſcennius*, which the curious at *Marſeilles* were deſirous to purchaſe, and had offered him a conſiderable ſum for it; but as he hoped to get more at *Paris*, eſpecially if it was not in the King's cabinet, he deſired him to let him know that, as likewiſe what value Mr. *de Boze* put upon

(1) *Le P. Elizée de St. Benoiſt.*

upon it. His anſwer was, that he would certainly give a good price for it, if it was antient; but that he could offer nothing, till he had ſeen it. The owner therefore brought him the medal, which was fair, well preſerved, and free from any thing, which might occaſion the leaſt ſuſpicion; ſo that he valued it conſiderably higher, than what had before been offered, and immediately purchaſed it for the King.

Soon after he ſhewed it to the greateſt connoiſſeurs and moſt curious perſons at *Paris*, who were charmed with the ſight of ſo valuable and unexpected a medal in the Royal cabinet. And many both natives and foreigners being deſirous of a draught of it, he ordered it to be ingraved; together with a Greek medallion in ſilver, no leſs rare in its kind, of the ſame emperor, which is alſo in the ſame cabinet, having been purchaſed at *London* by Mr. *Vaillant* of Mr. *Falkner* (1), father of Sir *Everard*. A print of both theſe peices accompanies this paper. *See* TAB. I. *Fig.* 3 and 4.

The gold medal, *Fig.* 3. has on one ſide the head of *Peſcennius Niger* crowned with laurel, with this legend, IMP CAES C PESC NIGER IVSTVS AVG. And upon the reverſe, the godeſs *Concord*, repreſented by a female figure ſtanding, with a diadem on her head, one of her hands elevated, and a double horn of plenty in the other; and round the figure only the word CONCORDIA. For the letters PP, placed below in the feild, on the two ſides of the figure, being the uſual abbreviation of PATER PATRIAE, arc

(1) See *Numiſm. Imp. Rom. praeſt. p.* 216. *ed.* 1696.

are to be conſidered as part of the inſcription ſurrounding the head of *Peſcennius*. And it is well known, as Mr. *de Boze* obſerves, that in many medals of the Roman emperors nothing is more common, than to find on the reverſe a continuation of thoſe titles, which could not be contained on the ſame ſide with the head. But he thinks it has not been yet ſufficiently attended to, that in many medals of the cities in *Leſſer Aſia*, and eſpecially of thoſe in *Cilicia*, where *Peſcennius* was firſt proclaimed, the title *Pater patriae*, which they expreſſed by the two Greek letters Π Π, for Πατὴρ πατρίδος, is ſcarce ever placed in the circular inſcription on either ſide, but in the feild of the reverſe. For which reaſon he is inclined to beleive, that this medal was ſtruck at *Tarſus*, the metropolis of *Cilicia*, where that practice was more conſtant, than in any other place.

It would ſcarce be worth obſerving, he ſais, that in the word CONCORDIA the letter D is inverted after this manner ɑ, ſince ſuch miſtakes are very common both in antient and modern coins; was it not to prevent any imaginary ſuſpicion of its being done by deſign, as emblematical of a pretended concord between the two emperors *Septimius Severus* and *Peſcennius Niger*. But this he ſhews to be highly improbable on the following accounts. Firſt, that it is wholly inconſiſtent with the elegancy, grandeur, and ſimplicity of antient monuments; and eſpecially of thoſe appointed by authority, which never admitted of any kind of ridicule. Again, that it is a manifeſt abuſe of the language of medals to imagine, that when they exhibit the name or figure of any

any deity, as *Concord*, *Plenty*, *Peace*, and others, any thing more is ſignified, than addreſſes made to them on the account of what is there expreſſed, and hopes of its being granted to the public. This he illuſtrates from ſeveral inſtances of imperial medals, which need not be here recited. And he further obſerves from the hiſtorians of thoſe times, that *Peſcennius*, at the begining of his reign, might think it no difficult matter to have adjuſted matters with *Severus* upon terms advantageous to himſelf.

The ſilver medallion mentioned above, *Fig.* 4. has likewiſe the head of *Peſcennius*, crowned with laurel; and a Greek inſcription round it thus abbreviated, ΑΥΤΟΚ ΚΑΙCΑΡ Γ ΠЄCΚЄ ΝΙΓΡΥ Δ. that is, *Imperatori Caeſari Caio Peſcennio Nigro Juſto.* On the reverſe is an eagle ſtanding on a club, with the legend ΠΡΟΝΟΙΑ ΘЄΥΝ, *Providentia Deorum*; which is found alſo upon the medals of his predeceſſor *Pertinax*, with whom he is compared by hiſtorians both for his civil and military virtues. And Mr. *de Boze* apprehends, that as the eagle and club are the uſual ſymbols of Greek medals ſtruck at *Tyre*, this might probably have been coined there, either in the year 193, the firſt of his reign, or at the begining of the following year; that is, before the two defeats, which he received, firſt near *Cyzicus* in the *Helleſpont*, and after that between *Nicaea* and *Cius* cities of *Bithynia*. For then the cities, which *Severus* had artfully indeavoured to draw over to his intereſt, declared for him; more from a jealoſy of their neighbours, as *Herodian* obſerves, than from any diſlike to *Peſcennius* (1). This revolt was begun

(1) *Lib.* III. *cap.* 2.

begun at *Nicomedia* in hatred of *Nicaea*, which was very zealous for *Peſcennius*, and greatly favoured by him. *Tyre* and *Laodicea* followed the example of *Nicomedia*, from an averſion to *Antioch* and *Berytus*. And in like manner *Perinthus*, in oppoſition to *Byzantium*. In order to put a ſtop to this threatening miſchief, *Peſcennius* ordered ſome of thoſe cities to be plundered and burnt, particularly *Tyre* and *Laodicea*. But among all the cities, which eſpouſed his intereſt, *Byzantium* behaved with the greateſt gallantry; and even after his death held out a ſiege of three years againſt all the power of *Severus*, till at length being reduced by famine it was taken, and the walls demoliſhed. Mr. *de Boze* has given a ſuccinct account of this tragical ſcene from *Dion Caſſius* (1). But as it was not his deſign to write a narrative of all the occurrences relating to thoſe wars, which may be found in the hiſtorians, who have profeſſedly treated of them (2); he imploys the remainder of his diſcourſe upon ſome particular circumſtances, which reſpect *Peſcennius*, and have not been yet ſo throughly conſidered, as they deſerve.

And he remarks here, that the accounts of hiſtorians relating to the deſcent of *Peſcennius* are doubtful and uncertain; ſome telling us, that he ſprang from a patrician and conſular family, which had been imployed in the higheſt offices of ſtate, and dwelt long at *Rome* in great ſplendor: but others, that his birth was obſcure, both his father and grandfather

(1) *Lib.* LXXIV. *p.* 844.
(2) *Herodian*, *Dion*, *Spartian*, Mr. *Tillemont Tom.* III.

father being no more than agents, or overſeers, at the ſmall town *Aquinum* in *Naples*; and that properly ſpeaking he was a ſoldier of fortune, who raiſed himſelf gradually to command the forces in *Syria*, and gained ſome precarious honours, and a limited conſulſhip, by the intereſt of the freedmen of *Commodus*, but principally of *Narciſſus* the gladiator. But there are ſeveral antient *Inſcriptions* yet preſerved, beſides other monuments, which may afford ſome light in this affair. *Gruter* has ſeven in his *Collection*, with the name of *Peſcennius*; and there are ſome others in *Reineſius*, *John Baptiſt Doni*, and *Anthony Muratori*; and a Greek one in the *Miſcellanea* of *Spon*, with Γ ΠΕΣΚΕΝΝΙΟΣ ΟΝΗΣΙΜΟΣ. But the great variety in the *cognomen* of theſe perſons render it wholly improbable, that all of them ſhould have been of the ſame family with the emperor *Peſcennius*; ſince there is no family, even in the moſt flouriſhing times of the republic, which appears to have contained ſo many branches diſtinguiſhed by a different *cognomen*. And therefore he ſuppoſes moſt of them to have been freedmen or clients, who uſually aſſumed the family name of their patrons, of which he produces many inſtances; beſides others of foreign princes, who paid the like compliment to the Roman emperors.

But *Philip à Turre* has publiſhed the fragments of two *Inſcriptions* (1), containing the rites and ceremonies of the *Fratres Arvales*, who were a college of prieſts of great eſteem and dignity at *Rome*. Now

(1) *Frament. inſcript. Fratr. Arval.*

Now among the members of this college mention is made of one *Peſcennius Niger*. And as thoſe *Inſcriptions* are dated in the fourth conſulſhip of *Commodus* and ſecond of *Aufidius Victorinus*, which anſwers to the year 183 of our common *aera*; *Muratori*, who has ſince republiſhed them, ſais in a note, that this is the ſame *Peſcennius*, who ten years afterwards was advanced to the empire. But here, as Mr. *de Boze* very accurately remarks, he has not obſerved the difference of the *praenomen*, which in all the remaining medals of this emperor is *Caius*, but in both the inſcriptions *Publius*; nor taken care, as he might have done, to ſupport his opinion, notwithſtanding that difference in the *praenomen*. For *Commodus*, who has uſually the *praenomen* of *Marcus*, has ſometimes that of *Lucius*; and *Geta* either *Lucius* or *Publius* indifferently; as *Aemilian* has *Caius* and *Marcus*. Theſe are the only inſtances, which have occurred to him; but he thought it proper to mention them, that if any new medal of *Peſcennius* ſhould be found with *Publius* as the *praenomen*, it might not be rejected meerly on that account.

For a further illuſtration of his family he refers to ſome paſſages in *Spartian*, who relates, that in the gardens of *Commodus* at *Rome* the figure of *Peſcennius* in moſaic work was placed among thoſe of the moſt intimate freinds of that emperor, as performing a ſacrifice to *Iſis* (1). The ſame writer likewiſe ſais, that ſix perſons of the name of *Peſcennius* were

(1) *Frament. inſcript. Fratr. Arval. p. 76.*

were put to death by *Severus*, all of them men of eminence and dignity (1). And he further adds, that his houſe at *Rome* was remaining in his time, and went by the name of *Peſcenniana*; on the pediment of which was placed his ſtatue, which had been ſent him as a preſent *a rege Thebaeorum*, as he expreſſes it (2). But what the real character of the perſon was, called here *rex Thebaeorum*, has not hitherto, as Mr. *de Boze* remarks, been rightly ſettled; with this inquiry therefore he concludes his diſcourſe.

Caſaubon, and after him *Salmaſius*, *Reineccius*, and Sir *John Marſham*, ſuppoſe there was then a governor of that part of *Aegypt*, ſubject to the *Romans*, to whom they gave the title of *Rex*. But as this notion is no ways countenanced by hiſtory, he thinks it cannot well be admitted; and then procedes to offer his own opinion with equal learning and addreſs. *Auguſtus*, after the defeat of *Antony* and *Cleopatra*, having reduced *Aegypt* into the form of a province, divided the government of it among ſeveral perſons of the equeſtrian order; not thinking it ſafe to intruſt a nation ſo unſteady, daring, and always given to change, in the hands of ſenators, who were otherwiſe too powerful. This diviſion of *Aegypt*, as *Arrian* obſerves, was made by the *Romans* in imitation of *Alexander* (3). And the governors, as *Strabo* ſais, appointed by the emperor, tho perſons of moderate rank, had τὴν τοῦ βασιλέως

(1) *Frament. inſcript. Fratr. Arval. p.* 69.
(2) *Ibid. p.* 78.
(3) *Arrian. De exped. Alex. L.* III. *c.* 5.

βασιλέως τάξιν, *the authority of a king* (1); or, as *Tacitus* expreſſes it, were *loco regis* (2). And agreably to this *Spartian*, ſpeaking of the emperor *Severus*, tells us, that notwithſtanding he granted to the *Alexandrians* a civil juriſdiction for their private concerns; yet in all other things he ſubjected them to the abſolute government of a perſon ſent by the emperor, *ut ſub regibus ante vivebant* (3). From theſe reflexions Mr. *de Boze* thinks it may naturally enough be imagined, that this *king of Thebes* mentioned by *Spartian* was no other than a Roman knight, who commanded at *Thebes* with the authority of a king; and might be ſo called there, in common with the governors of other parts of *Aegypt*; and even at *Rome* too in their ordinary diſcourſe. Which may ſeem the more probable, if it be conſidered, how free the Romans made with that name, and to how many things they applied it; as *rex ſacrorum, conviviorum,* and others. He further obſerves, that the cuſtom of giving the title of *king* to one of their own magiſtrates obtained alſo at *Athens*, and ſome other cities of *Greece*; and then concludes his diſcourſe with a favourable character of *Peſcennius Niger*, taken from antient accounts.

G. C. May 28.
1750.

J. Ward.

---

(1) *Lib.* XVIII. *pag.* 797.
(2) *Hiſt. Lib.* I. *cap.* I.
(3) *In vit. Sever. p.* 70.

IX.

IX. *A Letter from* Robert More *Eſq*; *to the* Preſident, *containing ſeveral curious Remarks in his Travels through* Italy.

SIR,

Read June 14. 1750. I FIND myſelf ſo agreeably led through *Italy* by your Letter, which I received from Mr. *Watſon*, that I cannot help adding to the Trouble I before gave you, this, with my hearty Thanks.

When I got to *Barcelona*, I did not indeed find an Opportunity of going immediately to *Naples*, as you propoſed; yet am I not ſorry that I was forced through the South of *France*, where are many Places, I thought, well worth ſeeing.

When I got into *Italy*, it was moſt convenient for me to haſten to *Rome*; where I ſpent the Winter; and went early to meet the Spring at *Naples*; from which I began your Route.

You cannot more regret your own not having ſeen the natural Curioſities of that Place, than I do the Loſs thereby to the Public. The Voyage-writers do not ſeem to me ſufficiently to have conſidered the Force and Effects of Steam, which may be formed by Springs of Water falling upon a vaſt Surface of the fluid *Lava*, and talk too much of Sulphur, deceived by the Complexion of a Salt that covers the Ground in ſome Places there. In the *Solfatara* I held a cold Iron in the Vent, and there ran down it a Stream of Water. When I went down into the *Crater* on the Top of *Veſuvius*, it was full of Smoak.

Smoak. Yet I did not perceive it ſuffocating, and thought it Steam. The Guides indeed tell the *Engliſh*, that a Milorde of their Country was ſuffocated there: Being asked his name, they think it was my Lord *Plinio*. That which they call Sulphur, when I got it home, ran *per deliquium*.

I owe to you the ſeeing of *Beneventum*; a Place full of Antiquities. At *Arienzo*, a Village half-way to it, I ſaw Coppice-woods, from which they make *Manna*. They are of the Tree which our Gardeners call the flowering Aſh. The Manna is procured by wounding the Bark at the Seaſon, and catching the Sap in Cups: It begins to run (they uſed the Scripture-Term *Piovere*, i. e. *to rain*) the Beginning of *Auguſt*; and, if the Seaſon proves dry, they gather it 5 or 6 Weeks. The King has a great Revenue from it; yet the Tree grows as well in *England*.

At *Terni* I was obliged to your Directions for ſeeing the Caſcade below, as well as above. I went down by the Side of the Precipice; which I believe few have done; or they would not imagine the Fall ſo little as *Miſſon* make it, very ſhort of what the People of the Place call it. —— Mr. *Addiſon*, on the contrary, makes the Aqueduct at *Spoleto* as many Yards, as I take it to be Palms. One finds indeed ſtrange Incorrectneſs in all the Travel-writers (tho' you very juſtly recommended the beſt) when one reads them upon the Spot. —— One of them conjectures the fine Bridge in Ruins at *Narni* might have been an Aqueduct, which manifeſtly roſe all the Way towards the Town, to eaſe the ſteep Aſcent to it. But I was moſt ſurpriſed to ſee Mr. *Addiſon* miſ-

quote

quote a *Latin* Verſe of *Bembo*'s, under a Statue of *Bacchus*, which I think he calls *Apollo*'s.

I believe the *Muſeum* of the *Specula* at *Bologna* is improved ſince you were there; the joint Collections of Count *Marſigli*, Marcheſe *Coſpi*, *Aldrovandus*, and others, form the fineſt Sett of natural Curioſities I ever ſaw; and are now improving by the Munificence of the preſent Pope.

I had certainly miſſed ſeeing the continual Fires upon the *Apennines*, by the Badneſs of the Weather, if it had not been for your Caution. I indeed ſaw that at *Fiorenzuola* only at a Diſtance; but I ſpent good Part of a Night over a more conſiderable one, as they told me, at *Pietra Mala*, a Village among the Snows. The Fire I imagine to be of the ſame ſort with that about a little Well at *Broſely* * in *Shropſhire*; of which I think the *Society* has had an Account; the ſame as of the foul Air ſent them from Sir *James Lowther*'s † Coal-pits; and the like made by a Gentleman with Filings of Iron and Oil of Vitriol. The Flame here, when I ſaw it, was extremely bright, cover'd a Surface of about 3 Yards by 2, and roſe about 4 Feet high. After great Rains and Snows, they ſaid, the whole bare Patch, of about 9 Yards Diameter, flames. The Gravel, out of which it riſes, at a very little Depth, is quite cold. There are three of theſe Fires in that Neighbourhood; and there was one they call extinct. I went to the Place to light it up again, and left it flaming.

The

* See *Philoſ. Tranſ.* N°. 482, *p.* 371. † N°. 482, *p* 109. N°. 442, *p.* 282.

The Middle of the laſt Place is a little hollowed, and had in it a Puddle of Water: There were ſtrong Ebullitions of Air through the Water. But that Air would not take Fire; yet what roſe through the Wet wet and cold Gravel flamed brightly. Near either of theſe Flames, removing the Surface of the Gravel, that below would take Fire from lighted Matches.

Sir, I beg Leave to repeat my Thanks for your kind Aſſiſtance in this Tour, and to profeſs myſelf

Your moſt obliged, and

Leghorn, June 5. N. S. 1750.

obedient Servant,

Robert More.

X. *Extract of Letter from Mr.* William Arderon *F. R. S. to Mr.* Henry Baker *F. R. S. containing an Account of a* Dwarf; *together with a Compariſon of his Dimenſions with thoſe of a Child under four Years old*; *by* David Erskine Baker.

Norwich, May 12, 1750.

Read June 14. 1750.

" JOHN *Coan*, a Dwarf, was born at *Twitſhall* in *Norfolk*, in the Year " 1728, and has been ſhewn in this City for ſome " Weeks paſt. I weigh'd him myſelf *Apr.* 3, 1750, and " his Weight, with all his Cloaths, was no more than " 34 Pounds. I likewiſe carefully meaſured him, and

" found

" found his Height, with his Hat, Shoes, and Wig " on, to be 38 Inches. His Limbs are no bigger " than a Child of 3 or 4 Years old: His Body is per- " fectly ſtrait: The Lineaments of his Face anſwer- " able to his Age; and his Brow has ſome Wrinkles " in it, when he looks attentively at any thing. " He has a good Complexion, is of a ſprightly Tem- " per, diſcourſes readily and pertinently conſidering " his Education, and reads and writes *Engliſh* well. " His Speech is a little hollow, tho' not diſagreeable; " he can ſing tolerably, and amuſes the Company " that come to ſee him, with mimicking a Cock's " Crowing, which he imitates very exactly. In " 1744 he was 36 Inches high, and weigh'd 27 " Pounds and an half. His Father ſays, when about " a Year old he was as large as Children of that Age " uſually are, but grew very little and ſlowly after- " wards."

On receiving the Account of this little Man, a Child of 3 Years and not quite nine Months old, Son of the late very worthy *William Jones* Eſq; *F. R. S.* was meaſured and weighed. This Boy, tho' very lively and handſome, is no way remarkable for his Size; and therefore his Dimenſions and Weight, compared with the Dwarf's, may give a tolerable Idea of the real Smallneſs of the Dwarf.

The Weight of the Dwarf, with all his Cloaths on, was no more than 34 Pounds.

The Child's Weight, with its Cloaths likewiſe on, was 36 Pounds (*a*).

The

(*a*) The Cloaths, being weigh'd afterwards by themſelves, were two

	Inches.
The Height of the Dwarf, with his Shoes, Hat and Wig on	$38\frac{5}{10}$
The Height of the Child, without any thing on his Head	$37\frac{7}{10}$

	Dwarf. *Inches*	Child. *Inches*
Round the Waiſt	21	$20\frac{5}{10}$
Round the Neck	9	$9\frac{7}{10}$
Round the Calf of the Leg	8	9
Round the Ancle	6	6
Round the Wriſt	4	$4\frac{3}{10}$
Round the Thumb	2	$2\frac{1}{10}$
Length of the Arm, *viz.* from the Shoulder to the Wriſt	15	13
From the Elbow to the End of the middle Finger	$10\frac{4}{10}$	10
From the Wriſt to the End of the middle Finger	4	4
From the Knee to the Bottom of the Heel	$10\frac{4}{10}$	$10\frac{7}{10}$
Length of the Foot with the Shoe on	6	$6\frac{4}{10}$
Length of the Face	6	$6\frac{2}{10}$
Breadth of the Face	5	$4\frac{8}{10}$
Length of the Noſe	$1\frac{2}{10}$	$1\frac{2}{10}$
Width of the Mouth	$1\frac{8}{10}$	$1\frac{8}{10}$
Breadth of the Hand	$2\frac{5}{10}$	$2\frac{5}{10}$

It

---

two Pounds fourteen Ounces; conſequently the real Weight of the Child is thirty-three Pounds two Ounces; which is but fourteen Ounces leſs than the Dwarf's Weight with all his Cloaths.

It may not be improper here to take notice, that as the Meaſures of the Dwarf were ſaid to be taken with his Cloaths on, theſe of the Child were alſo taken over his Cloaths; and they (being a tight Stay and Petticoat) probably ſit cloſer to his Body, and therefore make leſs Difference in the meaſuring round his Waiſt (the only Dimenſion wherein it could have any Effect) than the looſer Coat or Waiſtcoat of the Dwarf.

XI. *Part of a Letter from* Robert More *Eſq*; *to Mr.* W. Watſon *F. R. S. concerning the Method of gathering* Manna *near* Naples.

Read June 21. 1750.

AT *Arienzo*, a Town between *Naples* and *Benevento*, I found an Aſh-Coppice, of 8 or 10 Years Growth, from which they collect *Manna*. It ſeemed to have been tapped two Years for that Purpoſe; the Branches had been barked each Year about an Inch broad, and two Feet high; but they told me this was done by an Inch at a time.

They place a Cup at the Bottom of the Wound, which they empty every five Days This Liquor becomes *Manna*. They formerly let it dry upon the Tree; but the preſent way keeps it cleaner. The Manna begins to run (they ſay in the Scripture Style to *rain*) the Beginning of *Auguſt*; and if the Seaſon proves dry, they gather it 5 or 6 Weeks. The King of *Naples* has ſo large a Revenue from it, that he is extremely jealous of it, during the Seaſon guards

guards the Woods by *Sbirri*, who even fire upon People that come into them, and he makes the ſtealing of the Liquor Death. The Seaſon in which I was at *Arienzo* prevented my ſeeing the Species of Aſh. I believe it to be what our Gardeners call the flowering Aſh; the Complexion of the Bark and Bud agrees with one of them I have in my Garden at *Lindley*. The Man who ſhew'd me the Wood, told me, it bore a pretty Flower in the Spring. ——— At *Piſa* in the Phyſic-Garden they ſhew'd me that Tree in Bloom as the Manna-Aſh. The Tree is indeed common enough in that Neighbourhood: I wonder Mr. *Ray* does not mention it among the Plants found there by him. The *Italians* call it *Orno*. A Botaniſt at *Rome* told me it was the *Ornus Officinarum*. A Phyſician at *Benevento* to the ſame Purpoſe, that it was the *Ornus* uſed in Medicine. A Perſon is gone from *Rome* to *Naples*, who has promiſed to be very particular in getting you Information of their Manner of curing it. He was bred a Chemiſt, and told me many Ways of counterfeiting the ſeveral Appearances of it. The moſt common is with *Glauber's* Salts and Sugar, with a ſmall Mixture of Manna. The Price of Manna at *Naples*, they told me, was 4 *Carlins* (4½*d.* Sterling each) the *Rotolo* (32 Ounces).

XII.

XII. *A Letter from* John Huxham *M. D. F. R. S. to* C. Mortimer *M. D. Secr. R. S. containing Obſervations on the* Northern Lights, *ſeen* Feb. 15 *and* 16, 1749-50.

Dear Sir,

Read June 21, 1750. YOU have herewith an Account of two uncommon *Phænomena*, which I obſerved laſt *February*.

Feb. 15, 1749-50, in the Evening there was a very vivid Northern Light, which darted forth ſeveral beautiful, crimſon, and fiery-colour'd Rays; Wind NW*b*N 1, Barometer 30.2; 50 Minutes paſt 8 a ſurpriſingly bright and exceedingly white Arch, about the Breadth of a common Rainbow, appear'd in the Heavens, extending nearly from Eaſt to Weſt; it reach'd within 5 or 6 Degrees of the Weſtern Horizon, and ended about 8 or 10 above the Eaſtern. It paſſed exactly between *Caſtor* and *Pollux*, and directly over *Aldebaran*, which appeared plainly thro' it. Near the Top of the Arch ſeveral very lucid, white, ſhort, vibrating Columns were attached to it; none of them ſeem'd above 6 or 7 Degrees long, and did not appear to communicate in the leaſt with the *Aurora borealis*. The incloſed Figure (*ſee* TAB. I. *Fig.* 5.) ſomewhat repreſents it. About 9^h 12′ the Arch vaniſhed; but ſeveral white, bright, corruſcating *Nubeculæ* remain'd here and there in the Zodiac for 12 or 15 Minutes longer. The *Aurora borealis* continued more or leſs till Midnight: The next Morning the Wind was E. 1^x, Barom. 30.1.

Feb.

Feb. 16, about 7 *p. m.* we had another *Aurora borealis*, tho' not quite ſo fiery and luminous as that of the Night before: It continued till near 11. At 8^h 56′ *p. m.* exactly, ſuch another Arch appear'd, very nearly of the ſame Extent and Direction, but not altogether ſo broad or lucid. This at firſt alſo paſſed between the two bright Stars of *Gemini*, but declin'd more and more to the Southward, till it was 2 or 3 Degrees to the South of *Pollux*. Its Weſtern Limb, about 9, paſſed through the North Shoulder of *Orion*: It quite diſappear'd about 10 or 12 Minutes after. —— This had no Columns attach'd to it, as the former; tho' it was ſomewhat jagged and unequal towards the North near the *Vertex*. The Wind this Evening was E.2; the Barometer 29.9. The next Morning the Wind was SW*b*W 1, the Barometer 29.9. Neither any Part of the Arch, or the attached Rays were coloured, but perfectly white, and exceeding bright.

I am, dear Sir, with the greateſt Reſpect,

Plymouth, April 18, 1750.

Your affectionate, and moſt obedient humble Servant,

J. Huxham.

XIII. *A Letter from* John Starr *M. D. to* John Huxham *M. D. F. R. S. containing an Account of an* Horſe *bit by a* mad Dog.

Dear Sir, *Liskard*, Jan. 10. 1749.

Read June 21, 1750. BENEATH you have the Account you requeſted: If it contains any thing worthy your Peruſal, I ſhall be pleaſed. Nothing deſerving Notice is, I think, omitted: Every Circumſtance is truly, and it may be too particularly related.

Dec. 1, 1745. a Neighbour's large Maſtiff Dog, mad, broke out in the Night from the Place where he was too careleſly confin'd; and, by a rotten back Window, enter'd my Stable, fell upon my Horſe, and bit him in many Places, as Shoulder, Breaſt, and right Noſtril; which was indeed much torn. He bled largely. The Town being early in the Morning alarmed by this mad Dog, and my Horſe being found looſe, his Collar broke to Pieces, wounded in many Places, and much Blood ſcatter'd up and down the Stable, it was too juſtly concluded the Dog had fallen upon him.

According to *Deſault*'s Method, and what Dr. *James* ſays, in a Letter I had from him on another Occaſion, will effectually prevent the ill Conſequences of this Bite; I immediately order'd the Wounds to be well rubb'd with a mercurial Ointment, *ex Axung. porc.* ℥*vj*. *Argent. viv.* ℥*ij*. About ℥*ij*. were at times expended.

Next

Next Morning he was bled two Pounds or more; after which I gave him in Milk * *Lichen ciner. terreſt.* ℥vj. *Pip. nig.* ℥iiij. five Mornings ſucceſſively; which I repeated at the End of a Fortnight for four Mornings more.

As the *Pulv. Antilyſſus* was not in our Shops, and no one in Town knew the *Lichen* but myſelf, I went with my Servant *Sunday* Forenoon, the Day of my Horſe's Misfortune, to ſeek it. What I found was, I fear, too young; for it ſeemed juſt coming from the Earth, and the Leaves were ſcarce one third as big as at its full Growth. I got what I hop'd might be ſufficient; and, after cleanſing, perhaps too haſtily dry'd it at the Fire, that it might be ready for Uſe the next Day.

The Wounds heal'd up ſoon, without any other Application; and the Horſe fed uncommonly hearty after a Day or two (during which the Fright had made him uneaſy and fretful) and ſeemed to improve conſiderably in every reſpect. I omitted riding him for 20 Days; but about the 20th rid him two ſhort Journeys only. He travell'd chearful and brisk, and I took care not to heat him (for tho' the Horſe was old, I would not willingly have parted with him for 20 Pieces). I ſaw him every Day, but could in no reſpect diſcover any thing amiſs.

Dec. 25, two Days before the full Moon, my Servant told me, that in the Morning he trembled much on entering the Horſe-Pool, and refuſed to drink at the watering Trough; but in the Evening drank heartily at another Well. This alarmed me; but conſidering that Horſes frequently refuſe to drink there, and that he drank in the Evening, I was ſome-

* See theſe *Tranſ.* No. 237, p. 49, *anno* 1697.

what eaſy; but order'd my Servant, if he refuſed next Morning drinking at one, to try him at the other; and if he refuſed at both, to let me immediately know it.

Dec. 26. As ſoon as he enter'd the Horſe-Pool, he trembled all over in a moſt ſurpriſing manner, and would by no means attempt to drink. The Servant immediately return'd with him. I order'd him to be led into a ſmall Pool of Rain-Water which ſtood in my Court. The Trembling return'd; every Muſcle was ſtrangely agitated; he look'd as if he were melancholy on the Water, ſmelt to it, but would not touch it. Being put into the Stable, a Bucket of pure clean Water was brought to him; he eagerly thruſt his Mouth into the Water, but, endeavouring to ſuck it, a Convulſion ſeiz'd him.

I was now ſatisfied he had a true *Aquæ Pavor*. He was bled to about 3 Pints, Musk 3ß. *Cinnab. Ant.* 3*j*. made into a Ball with *Conſ. Anthos* was given him. In bleeding he once ſnapt at the Smith, tho' well known to him, having ſhoed him for Years: And indeed this was the only Time he attempted to bite any one.

In about two Hours after the Musk was given to him, I offer'd him with my own Hands about two Gallons of white Water warm: he drank it off without the leaſt Difficulty or Heſitation. Had I diſſolved in it two Ounces of Nitre, I had certainly done well.

Had the Quantity of Musk at firſt given been greater (for Dr. *James* writes, me he gives the above Quantity of the beſt Musk in a Watchfulneſs remaining after a febrile *Delirium* is remov'd), or had I now again repeated the ſame Ball, I am apt to think

think the Horſe might have been ſaved (this being the *Tonquin* Method, even after the Appearance of the *Hydrophobia*); for he was as yet quiet and tractable. I went to him as uſual, handled him, and he behav'd as in his former Health; but, being look'd on as a mad Horſe, I ſaw every one was afraid to meddle farther with him.

He eat both Hay and Oats heartily. In the Evening, about 9 o' Clock, more of the white Water was offer'd him, but he drank none.

Dec. 27. This Night the Madneſs increaſed much; for he had bit the Manger as far as he could reach, and made it quite ragged. In the Morning he frequently bit his Breaſt where the Wound had been; and when he happen'd to take hold, violently drew up the Skin with his Teeth. Both theſe things he did during the Day at times, but moſt in the Morning. I put a Tub of Water before him; he greedily ran his Noſe into it; but, endeavouring to drink, a dreadful Convulſion ſeized him, which ſometimes drew his Buttock to the Ground; at others his Back was ſo hollowed with it, that his Belly was brought almoſt down on the Litter. During the Convulſion he would groan in an affecting manner; and frequently cry out. As ſoon as the Convulſion was over, he repeated his Endeavours to drink with the ſame cruel Event; and would, I believe, had the Water ſtood before him, have repeated it the whole Day.

He ſtill eat his Allowance of Hay and Oats; but when not eating, he was continually thruſting out his Tongue, and working with his Lips, as if to moiſten and cool them. His Tongue was exceeding dry, and of a blackiſh-brown Colour on the

Surface. As he eat Oats, I have ſometimes lamented I had not mixed *Turpeth. mineral.* with them.

I tried him with Water about 9 at Night; every thing was as in the Morning; only the Convulſion was, if poſſible, ſtronger, and more excruciating; for he groaned deeper, louder, and in a more affecting Tone.

His Breath was exceeding hot; it came from his Noſtrils like Smoke from a Chimney-Top; he expanded his Noſtrils as if he had been violently running; and the Steam was viſible for more than a Yard Diſtance.

Dec. 28. This Night he broke his Collar in Pieces, broke down the Partition by which he was ſeparated from the Place of my other Horſe, traverſed the Stable, attempted to get out; in order to which he beat down the under Half of the Stable-Door; however, in the Morning, being ſpoken to by my Servant, he neigh'd, immediately went to his Place, where he ſtood biting his Breaſt and Manger almoſt continually. His Look was now become wild and furious, and about 10 o' Clock I order'd him to be ſhot. I am,

Dear Sir,

Your affectionate humble Servant,

J. Starr.

P. S. I obſerved he was always worſe, every Symptom being aggravated at the time the Moon came to the Meridian; which again, as the Day advanced, in ſome degree abated.

XIV.

XIV. Deſcriptio Fœtus monſtroſi ſine ullo Sexus Signo; *Regali Societati* communicata per *Job Baſter*, Acad. Cæſar. et Reg. Soc. *Lond.* Soc.

Read June 28. 1750.

QUamvis plurimæ ſint monſtrorum delineationes et deſcriptiones raro tamen occurrunt exempla, in quibus nullæ adſint partes genitales: cum tamen hic caſus mihi obvenit, *Regiæ Societati* hujus delineationes offero: (TAB. II. *Fig.* 1 and 2.) quem circiter ſeptimeſtrem ſaniſſima mulier, tertio partu, tempore gravidationis nulla imaginatione, metu, aut terrore percuſſa, in lucem edidit.

Caput hujus infantis non, uti oportet, erat ſphæricæ figuræ, ſed valde acuminatum, brachium dextrum bene formatum; ſiniſtri vero radius et ulna multo breviores eſſe videbantur.

Ne minimum partium genitalium, quibus ſexum diſtingueres, erat veſtigium, nec anus, aut ejus apertura; verum eo loco cutis, abundante pinguedine, quaſi in gyros erat reducta, et circumvoluta.

Ex medio ventre, genitalium loco, provenit pes unus in unicum quaſi digitum, ſine ungue tamen finiens.

Repetitis precibus apertio cadaveris fuit negata, externa delineatio conceſſa, quam *Regiæ Societati* debita reverentia offero, una cum delineationibus fœtus et hydrocephali, quorum hiſtoriam ante aliquot annos (anno 1742) *Regiæ Societati* obtuli, et N°. 466, *p.* 277, in *Tranſactionibus* legi poſſunt.

XV.

XV. *Some Experiments on Subſtances reſiſting* Putrefaction; *by* John Pringle *M. D. F. R. S.*

Read June 28, 1750. *here printed with Additions.*

THO' an Inquiry into the Manner how Bodies are reſolved by Putrefaction, with the means of accelerating or preventing that Proceſs, has been reckoned not only curious, but uſeful (*a*), yet we find it little proſecuted in an experimental way: Nor is it to be wonder'd at, conſidering how offenſive ſuch Operations are: Wherefore, as I have been led to make ſome Experiments and Remarks on this Subject, from the Accident of having had an uncommon Number of putrid Diſtempers under my Care in the Hoſpitals of the Army, I ſhall venture to lay before the *Society* what I have found ſomewhat different from the common Opinion, as well as ſome Facts, which, as far as I know, have not been mention'd before.

1. Finding it a received Notion, that Bodies by Putrefaction became highly alcaline, I made the following Experiments, to inquire how far this was true in Fact.

The

(*a*) Lord *Bacon* calls, "the inducing or accelerating Putrefaction "a Subject of very univerſal Inquiry;" and ſays, "that it is of ex- "cellent Uſe to inquire into the means of preventing or ſtaying "Putrefaction; which makes a great Part of Phyſick and Surgery." See *Nat. Hiſt. Cent.* IV.

The *Serum* of human Blood putrified, made, with a Solution of Sublimate, firſt a turbid Mixture, and afterwards a Precipitation. This is one of the Teſts of an *Alcali*, but ſcarce to be admitted here; ſince the ſame thing was done with recent Urine (of a Perſon in Health), which is never accounted alcaline. The ſame *Serum* did not tinge the Syrup of Violets green; and made no Effervescence when the Spirit of Vitriol was poured upon it. I made the Experiment twice upon Portions of different *Serum*, both highly putrid; and once on Water, in which corrupted Fleſh had been ſome time infuſed; and the moſt I could find was, that, having given the Syrup previouſly a ſmall reddiſh Caſt with an Acid, this Colour was rendered fainter, but not deſtroyed by the putrid Humours; and as to the Effervescence, having dropped the Spirit of Vitriol into theſe Liquors unmixed, and alſo diluted with Water, the Mixture was quiet, and only a few Air-bubbles appeared on ſhaking the Glaſſes. Upon the whole, tho' there were ſome Marks of a latent *Alcali* in the putrid *Serum*, they were ſo very faint, that one Drop of Spirit of Hartſhorn in a Quantity of Water equal to that of the putrid Liquors, ſhewed more of an *Alcali* than twenty Drops of any of the other.

2. It has been a Maxim, that all animal Subſtances, after Putrefaction, being diſtill'd, ſend forth a great Quantity of volatile Salt in the firſt Water; but Mr. *Boyle* found that this held good only in Urine; and that in the Diſtillation of the *Serum* of human Blood putrefied, the Liquor which firſt came over had little Strength, either as to its Smell or Taſte,

Taſte, and did not at firſt effervesce with an Acid. And here it may be obſerved, that the Chemiſts have generally applied thoſe Properties they diſcovered in Urine, to all the Humours indifferently; whereas, in Fact, there is a great Diverſity. For ſome animal Subſtances, ſuch as Urine and Bile, *ſoon* putrefy; the *Saliva* and the White of an Egg *ſlowly*. Yet thoſe that ſooneſt corrupt do not always arrive at the higheſt Degree of Putrefaction. Thus the Bile is ſoon corruptible, but the Rankneſs of it is not to be compared to that of Fleſh; and the White of an Egg is not only much leſs diſpoſed to putrefy than the Yolk, but, when corrupted, yields a different and leſs offenſive Smell. And it ſeems particular to ſtale Urine to contain an alcaline Salt, which, without Diſtillation, makes a ſtrong Effervesence with Acids: Whereas moſt other animal Humours putrefied, tho' of a more intolerable *Fœtor*, yet contain leſs volatile Salt, leſs extricable, and not effervesing with Acids. But what makes the Difference between ſtale Urine and other putrid Subſtances ſtill more ſpecific, is, its Inoffenſiveneſs with regard to Health; whilſt the Steams of moſt other corrupted Bodies are often the Cauſe of putrid and malignant Diſeaſes.

Now, upon finding in Urine a much greater Quantity of volatile Salt, and that more eaſily ſeparable than in any other Humour, and that ſtale Urine is the leaſt noxious of putrid animal Subſtances, ſo far then from dreading the volatile *Alcali* as the deleterious

* Nat. Hiſt. of Human Blood, *Vol.* IV. *p.* 178. *fol.*

leterious Part of corrupted Bodies, from this Inſtance we may rather infer it to be a ſort of Corrector of Putrefaction.

3. Daily Experience ſhews how harmleſs the Volatiles are, both when ſmelled to, or taken in Subſtance; but ſtill there remains a Prejudice, as if theſe Salts, being the Produce of Corruption, ſhould therefore haſten Putrefaction; not only in Diſtempers where theſe Salts are unwarily taken, but alſo in Experiments out of the Body.

Now, as to the Effects ariſing from the internal Uſe of them, little can be ſaid, unleſs the kind of Diſeaſe was preciſely ſtated. For, ſuppoſing they were by their Nature diſpoſed to promote Putrefaction; yet if that is already begun, from a Languor of Circulation, and Obſtruction, then may the Volatiles, by their ſtimulating and aperient Quality be the means of ſtopping its Progreſs: And, on the other hand, tho' they were really antiſeptic, yet if the Humours are diſpoſed to corrupt from Exceſs of Heat or Motion, theſe very Salts, by adding to the Cauſe, may augment the Diſeaſe. So that, upon the whole, it will be the faireſt Criterion of the Nature of theſe Volatiles to enquire, whether out of the Body they accelerate or retard Putrefaction.

In order to decide this Queſtion, I have made repeated Experiments of joining both the Spirit and Salt of Hartſhorn to various animal Subſtances; and have conſtantly found, that, ſo far from promoting Putrefaction, they have evidently hinder'd it; and that with a Power proportioned to their Quantity. The Trials have been made with the *Serum* of the Blood, and alſo with the *Craſſamentum*, after it had

been dried by keeping. I once ſeparated the thick inflammatory Cruſt of pleuritic Blood from the reſt of the Maſs; and, dividing it, I put one Portion into diſtill'd Vinegar, the other into Spirit of Hartſhorn; and after keeping the Infuſions above a Month in the middle of Summer, I found the Piece which lay in alcaline Spirit as ſound as that in the Acid.

Another time I put in one Phial about an Ounce and a half of an equal Mixture of Ox's Gall and Water, with 100 Drops of Spirit of Hartſhorn; and in another as much of the Gall and Water without any Spirit. The Phials, being corked, were ſet by a Fire, ſo as to receive about the Degree of animal Heat; whereby, in leſs than two Days, the Mixture without the Spirit became putrid, but the other was not only then, but after two Days longer untainted.

I afterwards infuſed two Drachms of the Lean of Beef with two Ounces of Water and half a Drachm of Salt of Hartſhorn. Another Phial contained as much Fleſh and Water with a double Quantity of Sea-Salt: In a third was the Fleſh and Water only to ſerve by way of Index. Theſe Phials were placed on a Lamp-Furnace, in a Heat varying between 94 and 104 Degrees of *Fahrenheit*'s Scale. About 18 Hours after Infuſion, the Contents of that Phial which ſerved as an Index, were rank; and in a few Hours more that with the Sea-Salt was alſo putrid; but the Fleſh with the volatile Alcali was ſound, and continued ſo after ſtanding 24 Hours longer, in the ſame Degree of Heat: And that the Smell of the Hart's-horn might occaſion no Deception, the Piece of Fleſh was waſhed from the Salt, and ſtill ſmelled ſweet.

About the ſame time I took three Pieces of freſh Beef, of the ſame Weight as above; and laying two

of them in Gallypots, I cover'd one with Saw-duſt, and the other with Bran: But the third Piece being ſtrew'd with Salt of Hartſhorn powder'd I put into a four Ounce Phial which had a glaſs Stopper. They were all three placed in the Outſide of a Window expoſed to the Sun; and the Weather being warm, on the third Day the Fleſh in the Gallypots began to ſmell; on the fourth were putrid. Next Day the Phial was examined; when the Fleſh was waſhed from the Salt, and found quite ſweet. It was then dry'd and ſalted again with Hartſhorn; and having ſtood in the Houſe ſome Weeks longer in ſultry Weather, it was look'd at a ſecond time, and obſerved to be as ſound as before; neither was the Subſtance at all diſſolved, but was of ſuch a Conſiſtence as might be expected from common Brine*. And leſt it might be ſuſpected, that the Fleſh in the Gallypots, by being more expoſed to the Air than that in the Phial, became ſooner putrid, I have ſince incloſed Fleſh in Phials, as that with the Hartſhorn and found the Confinement rather haſten the Putrefaction.

Now, by theſe and many other Experiments of the kind, finding volatile alcaline Salts not only do not diſpoſe animal Subſtances to Putrefaction out of the Body, but even prevent it, and that more powerfully than common Sea-Salt, we may preſume that the ſame taken by way of Medicine, will, *cæteris paribus*, prove antiſeptic; at leaſt we cannot juſtly ſuppoſe them Corrupters of the Humours more than fermented Spirits or Sea-Salt; which

* The ſame Piece has been ſince kept dry a Twelvemonth, and is ſtill untainted, and as firm as at firſt.

taken in immoderate Quantities may raiſe a Fever, and thereby accidentally be the Occaſion of Corruption.

4. I have likewiſe made ſeveral Experiments with the fixed alcaline Salts, which have no leſs antiſeptic Power than the volatile. The Trials were made both with the Lye of Tartar and Salt of Wormwood. But here we muſt not confound a diſagreeable Smell of ſuch Mixtures with one that is really putrid; nor the Power thoſe Lixivials have of diſſolving animal Subſtances with Putrefaction.

5. From theſe Experiments it was natural to conclude, ſince Acids by themſelves were amongſt the moſt powerful Antiſeptics, and the alcaline Salts were likewiſe of that Claſs, that the Mixtures of the two to Saturation would reſiſt Putrefaction little leſs than the Acid alone. But in the Trials I have made upon Fleſh with a *Spiritus Mindereri* compoſed of Vinegar ſaturated with Salt of Hartſhorn, and alſo with the Juice of Lemons ſaturated with the Salt of Wormwood, I found the antiſeptic Virtue conſiderably leſs than when either the Acids or *Alcali's* were uſed ſingly.

6. As for the comparative Virtues of theſe Salts upon Fleſh, I found half an Ounce of Lemon-juice ſaturated with a Scruple of the Salt of Wormwood reſiſted Putrefaction nearly as much as fifteen Grains of Nitre; but, when the Trial was made with Ox's Gall, two Drachms of this Mixture were more antiſeptic than a Scruple of that Salt. Again, Nitre compar'd with the dry neutral Salts, Weight for Weight, is more antiſeptic than any in preſerving Fleſh I have yet tried. Crude *Sal ammoniac.* came next to it, and even exceeded it in the Experiment with Ox's Gall. After theſe the *Sal diureticus*, *Tartarus ſolubilis*, and

and *Tartarus vitriolatus*, ſeemed to have nearly the ſame Power.

I have mixed Vinegar with a large Quantity both of Chalk and Crabs-eyes, in order to neutralize it; but, tho' ſeemingly ſaturated by the Effervescence ceaſing, it ſtill retain'd an Acidity, and was found much more antiſeptic than Lemon-juice neutraliz'd with the Salt of Wormwood; tho' this laſt Acid be conſiderably ſtronger than Vinegar.

7. Thus far have we conſider'd the common neutral Salts; which, however powerful in reſiſting Putrefaction, are inferior to ſome reſinous Subſtances, and even ſome Vegetables which I have tried. Thus Myrrh, in a watry *Menſtruum* was found at leaſt twelve times more antiſeptic than Sea-Salt. Two Grains of Camphire mixed with Water preſerved Fleſh better than ſixty Grains of that Salt: And I imagine, could the Camphire be kept from flying off, or concreting to the Sides of the Phial, that half a Grain, or even leſs, would have ſufficed. An Infuſion of a few Grains of *Virginian* Snake-root in Powder exceeded twelve times its Weight of Sea-Salt. Chamomile-Flowers have nearly the ſame extraordinary Quality. The Jeſuit's Bark has it alſo; and if I have not found it ſo ſtrong as the two Subſtances laſt mention'd, I impute that in part to my not being able to extract its embalming Parts in plain Water.

Now Vegetables poſſeſſing this balſamic Quality are the more valuable, in that, being uſually free of Acrimony, they may be taken in much greater Quantities than either Spirits, Acids, Reſins, or even the neutral Salts. And as in the great Variety of Subſtances anſwering

anſwering this Purpoſe, there may be alſo ſome offenſive or uſeful Qualities annexed, it may not be amiſs perhaps to review ſome Part of the *Materia medica* for this End.

I ſhall add, that, beſides this extraordinary Power in preſerving Bodies, I have diſcover'd in ſome of theſe Subſtances a ſweetening or correcting Quality after Putrefaction had actually begun. But theſe Experiments I ſhall lay before the *Society* ſome other time; with a Table of the comparative Force of Salts, and ſome further Remarks on the ſame Subject.

N. B. *Theſe Experiments will be continued in the next Number of theſe Tranſactions.*

XVI. *An attempt to explain an antient Greek inſcription, ingraven upon a curious bronze cup with two handles, and publiſhed with a draught of the cup by Dr.* Pococke, *in his* Deſcription of the Eaſt, Vol. II. Part 2. pag. 207. *By* John Ward, *Pr. Rhet. Greſh. and F. R. S.*

Read June 28. 1750.

THE diameter of the cup on the inſide is about thirteen inches and a half, as near as I could take it from a copy of the inſcription, which is placed round the upper ſide of the rim. A draught of which is hereunto annexed, reduced to about two thirds of the ſize (1); and

(1) See TAB. II. *Fig.* 3.

and may alſo be ſeen in Dr. *Pococke*, with only this difference, that the characters on the cup are not cut in continued lines, as in the doctor's plate, but conſiſt of ſeparate points placed in the form of letters, as here repreſented. Letters expreſſed in this manner appear upon ſeveral antient coins; and may likewiſe be ſeen in the ſilver plates, found not long ſince in *Hertfordſhire*, and publiſhed in theſe *Tranſactions* (1). As to the circular form of the inſcription, we read in *Pauſanias* of an inſtance not very much unlike this. *Iphitus* king of *Elis* is ſaid to have reſtored the Olympic games, during which all hoſtilities ceaſed among the ſeveral ſtates of *Peloponneſus*. Throwing the *diſcus* or *quoit* was one of the exerciſes performed in thoſe games, and the *diſcus* of *Iphitus* was depoſited in the temple of *Juno* at *Olympia*; upon which the ceſſation of arms, always obſerved at that ſolemnity, being ingraved was then publicly read. Which inſcription, as the hiſtorian obſerves, was not cut in ſtrait lines, but in the form of a circle. Tho whether the letters were placed on the face of the *diſcus*, or upon the edge, like ſome modern coins, is not expreſly ſaid. The words are theſe: Ταύτην [ἐκεχειρίαν] οὐκ ἐς ἐυθὺς ἔχει γεγραμμένην, ἀλλὰ ἐς κύκλου σχῆμα περίεισιν ἐπὶ τῷ δίσκῳ τὰ γράμματα. That is: *Hae* [induciae] *non recto verſuum ordine ſunt inſcriptae, ſed literis in diſco orbem ambientibus* (2).

But

(1) *Num.* 476.

(2) *Pauſanias, Lib.* v. *c.* 20. *p.* 427. *ed. Lipſ.* 1626. Where *Pet. Faber* for ἐς ἐυθὺς reads ἐς ἐυθὺ, *Agoniſt. Lib.* II. *c.* 26.

But I return to the inſcription on the cup, which, as I apprehend, may be thus read in the common *Greek* characters.

Μ Ν Δ
ΒΑΣΙΛΕΥΣ ΜΙΘΡΑΔΑΤΗΣ ΕΥΠΑΤΩΡ
ΤΟΙΣ ΕΝΤΟΣ ΤΟΥ ΓΥΜΝΑΣΙΟΥ ΕΥΠΑΤΟΡΙΣΤΑΙΣ
ΓΥΦΑ vel ΓΟΥΦΑ ΔΙΑΞΩΖΕ.

In *Latin* thus:

Monumentum dedit
Rex Mithradates Eupator Eupatoridis
in gymnaſio [vel *intra gymnaſium*]
Gypha [vel *Gupha*] *ſervavit.*

I. The letters Μ Ν Δ ſtand by themſelves over the reſt, which are placed below them in the form of a circle; which circle is made up of the four ſegments here put one under another, when united in one orbicular line. And the ſituation of theſe three letters in the annexed draught ſhews, over what words of the circular part they are placed. All the words from ΒΑΣΙΛΕΥΣ to ΕΥΠΑΤΟΡΙΣΤΑΙΣ take in above half the circumference of the rim of the cup; and the diviſion of this laſt word was occaſioned, as I ſuppoſe, by one of the handles being fixed there. The two laſt words ſtand at a conſiderable diſtance from the reſt, on the remaining part of the rim.

II. If thoſe three letters above the reſt are not a date, they may, as I conjecture, ſtand for μνημόσυνον δῶκε for ἔδωκε, without the augment. Where the word μνημόσυνον ſeems to be uſed in the ſame ſenſe, as we meet with it in *Catullus*, when he ſais, *Verum eſt* μνημόσυνον *mei ſodalis* (1).

III.

(1) *Epigram. ad* Aſinium.

III. In the circular line Μιθραδάτης is put for Μιθριδάτης, as his name is uſually writen. And ſo it is ſpelt in two other inſcriptions, both found by *Spon* in the iſle of *Delos*, at a conſiderable diſtance from each other, and publiſhed in his *Voyage d'Italie etc* (1). The like ſpelling may alſo be ſeen both on the coins of this prince (2), and in the edition of *Tacitus* publiſhed by *Lipſius*. Theſe inſcriptions were cut on the remaining pedeſtals of two ſtatues, which had formerly been placed there, one in honour of *Mithridates Euergetes* the father of this prince, and the other of himſelf. I ſhall here tranſcribe them both, as they will ſerve to illuſtrate that on the cup. The former runs thus:

ΒΑΣΙΛΕΩΣ ΜΙΘΡΑΔΑΤΟΥ
ΕΥΕΡΓΕΤΟΥ ΣΕΛΕΥΚΟΣ
ΜΑΡΑΘΟΝΙΟΣ ΓΥΜΝΑ
ΣΙΑΡΧΩΝ.

In Latin:

Regis Mithradatis Euergetae Seleucus
Marathonius gymnaſio praefectus
ſtatuam poſuit.

The latter is as follows:

ΒΑΣΙΛΕΩΣ ΜΙΘΡΑΔΑΤΟΥ ΕΥ
ΠΑΤΟΡΟΣ ΕΥΤΥΧ.....ΤΟΥ
ΜΙΘΡΑΔΑΤΟΥ ΕΥΕΡΓΕΤΟΥ
ΔΙΟΝΥΣΙΟΣ ΝΕΣ.....ΝΟΣ
ΑΘΗΝΑΙΟΣ ΓΥΜΝΑΣΙΑΡΧΗ
ΣΑΣ ΑΝΕΘΗΚΕΝ.

In Latin:

Regis

(1) *Tom.* III. *pag.* 86.
(2) *Numiſm. Pembroch. Par.* II. *tab.* 66.

Regis Mithradatis Eupatoris Eutych.. filii Mithradatis Euergetae Dionyſius Neſ..nus Athenienſis gymnaſio praefectus poſuit ſtatuam.

It appears highly probable by theſe inſcriptions, that there was a *gymnaſium* (1), or college, at that time in *Delos*. And the ſame writer obſerves, that near to the former he found eleven pillars ſtanding without chapiters, and others lying on the ground. At which place, as he ſais, the inhabitants of the neighbouring iſles (for *Delos* was then uninhabited) have a tradition, that a college antiently ſtood; and he further adds, that the corſairs ſtill continue to call this iſland by the name of *The ſchools* (2). And therefore it is not improbable, that this cup, which ſome years ſince was found in the port of *Antium*, and (as Dr. *Pococke* ſais) is now placed among the antiquities of the capitol at Rome, might formerly have been brought from that iſland: and the name *Eupatoridae* given to thoſe of the college, in honour of this king *Mithridates*, their benefactor; who ſeems to have been pleaſed with the name *Eupator*, aſcribed to him in the latter inſcription, ſince he built a city in *Paphlagonia*, which he called *Eupatoria*, as we are told by *Pliny* (3) and *Appian* (4). By the latter of whom we learn alſo, that he was fond

(1) By the word *gymnaſium* among the Greeks was meant a number of contiguous buildings, with portico's and open walks, ſo diſpoſed as to be fitted, ſome for bodily exerciſes, and others for the ſtudy of the liberal arts and ſciences.

(2) *Tom.* I. *pag.* 177.

(3) *Nat. Hiſt. Lib.* VI. *cap.* 2.

(4) *Rom. Hiſt. pag.* 251, *ed. Steph.*

fond of fine ornaments, and elegant furniture; and had made a vaſt collection of them, of which vaſes were always eſteemed a conſiderable part (1). The imperfect word ΕΥΤΥΧ. which follows *Eupatoris* in the ſame inſcription, may perhaps ſtand for ΕΥΤΥΧΟΥΣ, *Eutychis*, or *Felicis*; as that word occurs at length in another inſcription diſcovered by *Spon* in the ſame iſland, of which the two names ΔΙΟΝΥΣΙΟΥ ΕΥΤΥΧΟΥ then only remained (2). Tho indeed I have not met with that name elſewhere aſcribed to *Mithridates*; notwithſtanding *Cicero* mentions a large catalogue of extravagant titles, which had been heaped upon him by his flatterers. *Mithridatem*, ſais he, *Deum, illum Patrem, illum Conſervatorem Aſiae, illum Euium, Nyſium, Bacchum, Liberum nominabant* (3). But yet it is poſſible, that the title *Eutyches* might have been given him, on account of his great ſucceſs in war for many years. As *Sylla* afterwards aſſumed that of *Felix*, for the like reaſon; and upon his triumph at *Rome*, for his victory over that powerful prince, had alſo his other titles of *Conſervator* and *Pater* aſcribed to him, as we are told by *Plutarch* (4). Theſe inſcriptions give us alſo the names of two preſidents of that college, the former of whom is called *Seleucus* of *Marathon*; and the latter *Dionyſius* of *Athens*, who might poſſibly have taken the

(1) *Rom. Hiſt. pag.* 251. *ed. Steph.*
(2) *Tom.* III. *pag.* 87.
(3) *Pro Flacc. c.* 25.
(4) *Vit. Syll. Tom.* V. *p.* 865. *ed. Steph.* See likewiſe *Pighii Annal. ad A.U.* 672.

the name *Dionysius* from his patron *Mithridates*, who besides the name *Eupator* assumed also that of *Dionysus* as the same author relates (1). But the second name of this latter president *Nes....nus* being imperfect, I am at a loss how to fill it up.

IV. The letters next following Ἐυπάτωρ upon the cup I take to stand for τοῖς ἐντὸς; tho they are strangely confused, by reason of a mistake, which seems to have been made at first in writing the inscription. In the word γυμνασίȣ the two letters να are united in one character. And as to the expression ἐντὸς γυμνασίȣ, which here refers to place, and not to time, as it more usually does; *Hesychius* has, ἐντὸς τȣ̃ σώματος; *Phavorinus*, ἐντὸς οἰκίας; and *Apollonius Rhodius*, as cited by *H. Steph.* ἐντὸς ἄϛεος. And in the word Ἐυπατορίϛαιζ, the letters στ are put for δ, and ζ for ς.

V. Of the two last words upon the cup, which (as has been observed) stand separate from the rest, the former is a proper name; but whether the first character in it was designed only for a Γ, or a combination of the two letters ΓΟ, I am not certain. In the following word διάξωζε without the augment, for διέσωσε, ξ is put for σ; and likewise ζ, as in the preceding word Ἐυπατορίσταιζ. I should have been led to imagine, that *Gypha*, or *Gupha*, might be the name of the sculptor, and διάξωζε stand for διέξυσε, *exsculpsit* or *persculpsit*; it being a common practice for artists to set their own names to their works; had it not appeared an objection to this, that

(1) *Ibid. pag.* 250. See also *Plut. Sympos. L.* I. *q.* 6.

that the inſcription is no better executed; and likewiſe that neither the form, nor combination, of the letters ſeems to ſuit with the age of *Mithridates*. I am therefore inclined to think, that the cup did not come into the hands of this perſon till a conſiderable time afterwards; who ſeems to have been no great ſcribe, but was willing however to preſerve both the memory of ſo curious a vaſe, and his own as the poſſeſſor of it.

As the ſeveral variations from the common manner of ſpelling, which occur in this inſcription, are to be met with in *Greek* writers; I ſhall trouble this Aſſembly with no further remarks upon them, than juſt to obſerve, that *Lucian* in his humorous diſcourſe, intitled *Judicium vocalium*, complains, that among many other innovations, which had then crept into the language, τ had invaded the place of δ, and both ξ and ζ that of σ.

Thus I have attempted to offer my thoughts upon this intricate inſcription, and explain it in ſuch a manner, as appeared to me the moſt probable, from a copy of it, communicated to me ſome years ſince by *Smart Lithieullier* eſquire, a worthy member of this Society, who had it from Father *Revillas* at *Rome*.

G. C. Sept. 15. 1749.

John Ward.

Poſtſcript.

Spon was at *Delos* in the month of *Auguſt* 1675, when he copied the two inſcriptions mentioned above. But it ſeems to be owing to the ſmallneſs of his page, that the former of them is printed in four lines;

for *Wheeler*, who took it at the ſame time, brings it into three, in the following manner:

ΒΑΣΙΛΕΟΣ (1) ΜΙΘΡΑΔΑΤΟΥ
ΕΥΕΡΓΕΤΟΥ ΣΕΛΕΥΚΟΣ
ΜΑΡΑΘΟΝΙΟΣ ΓΥΜΝΑΣΙΑΡΧΩΝ (2).

Tournefort, who was there in *October* 1700, confirms this draught of *Wheeler*, as to the form of it; and ſais, the inſcription was cut upon a ſquare pedeſtal, two feet five inches high, and two feet one inch broad. And as part of it was defaced at the begining of the lines, I have here tranſcribed the copy publiſhed by him, of what then remained.

.....ΠΟΘΡΑΔΑΤΟΥ
.....ΣΕΛΕΥΚΟΣ
.....Σ ΓΥΜΝΑΣΙΑΡΧΩΝ (3)

But Dr. *Anthony Askew*, a worthy member of this Society, who was there in *October* 1747, tho he found the pedeſtal pretty much broken, in the manner deſcribed by *Tournefort*; yet obſerved more letters of the inſcription then remaining, than are given us by him. The difference will appear by the following copy, with which the Doctor was pleaſed to oblige me out of his large and curious collection of inſcriptions, and other valuable antiquities:

.....Σ ΜΙΘΡΑΔΑΤΟΥ
.....ΟΥ ΣΕΛΕΥΚΟΣ
.....Σ ΓΥΜΝΑΣΙΑΡΧΩΝ.

The

(1) The O in this word ſeems to be a miſtake in the print for Ω.
(2) *Travels*, *pag.* 56.
(3) *Voyage du Levant*, *Tom.* I. *pag.* 297. *a Paris* 1717. *qu.*

The latter inſcription mentioned above, as erected in honour of *Mithridates Eupator*, was found, as *Spon* informs us, upon a round baſis, at a great diſtance from the other. It is likewiſe taken notice of by *Wheeler*, tho he has given no draught of it. But *Tournefort* ſuppoſes it to have been gon, before he was there; becauſe, upon ſearching for it, he could not find it. Which indeed is not to be wondered at; ſince we are told by *Spon*, that *Delos* being intirely in ruins, and without any inhabitants, the antient remains, being of *Parian* marble, are frequently carried away by ſtrangers, either for curioſity or uſe.

However *Tournefort* diſcovered part of another pedeſtal, in the ſhape of a cylinder, not far from the former of the two already mention'd. It lay half buried in the ſand, but being opened and waſhed, an imperfect inſcription was found upon it. The remaining words of which are theſe:

ΒΑΣΙΛΕΩΣ ΝΙΚΟΜΗΔ..
ΤΟΥ ΕΥΓΟΝΟΥ (1) ΒΑΣΙΛΕΩΣ
ΝΙΚΟΜΕΔΟΥ (2) ΕΠΙΦΑΝΟΥ
....ΚΟΥΡΙΔΗΣ (3) ΔΙΟΣΚΟΡΙΔΟΥ
ΡΑΜΝΟΥΣΙΟΣ ΓΥΜΝΑΣΙΑΡΧΟ..

In Latin thus:

Regis

---

(1) I am obliged likewiſe to Dr. *Askew* for a copy of this inſcription, taken by himſelf; by which it appears, that Υ in this word is a miſtake for Γ, as the Doctor has writen it.

(2) The E in this word is alſo a miſtake for H, as it is writen in the firſt line here, and by Dr. *Askew* in both places.

(3) I take this to be the ſame name as the following; the middle ſyllable of which is uſually writen with O, but ſometimes with OΥ. See *Grut. pag.* LXXXVI. *num.* 2.

Regis Nicomedis nepotis regis Nicomedis Epiphanis Dioſcorides Dioſcoridis Rammuſius praefectus gymnaſio ſtatuam poſuit.

King *Nicomedes*, to whoſe honour this inſcription was erected, is here called ἔγγονος, that is *grandſon*, of *Nicomedes Epiphanes* king of *Bithynia*. Which ſeems to confirm the account of *Appian*, who gives the name *Nicomedes* to the three laſt *Bithynian* kings. The firſt of whom being, as he ſais, the ſon of *Pruſias* (and here ſtiled *Epiphanes*) was ſucceded firſt by his ſon *Nicomedes Philopator*, and then by his grandſon, whom he calls barely *Nicomedes*, without ſubjoining any *cognomen*, agreably to this inſcription. And he further adds, that it was this laſt, who left his kingdom to the Roman people by his will (1). Which bequeſt was made in the year of the city 679, and was ſoon followed by their third and laſt war with *Mithridates Eupator* (2). Some have ſuppoſed this account of *Appian* to be erroneous, through a miſtake in the copies; becauſe other writers generally mention but one *Bithynian* king, as ſucceſſor to *Nicomedes Epiphanes*, who was alſo named *Nicomedes*, made the Roman ſtate his heir, and has been taken for his ſon (3). But the inſcription, by calling this latter the *grandſon* of the former, as *Appian* does, corroborates his account; who likewiſe ſais expreſly, that his ſon *Philopator* was

(1) *Rom. Hiſt. pag.* 175, *ed. Steph.*
(2) *Pigh. Annal. Rom.*
(3) See *Vaillant*, *Achemened. imper. Tom.* II. *pag.* 345, 354.

was confirmed in his father's kingdom by a decree of the Roman ſenate (1).

I thought it proper to take notice of this inſcription, not only as it ſeems to clear up the ſucceſſion of the *Bithynian* kings; but likewiſe as it contains the name of a third preſident of the college in *Delos*, and ſhews the regard that was paid to it by the princes of different countries in *Aſia*.

J. W.

XVII. *A Letter from Mr.* Henry Baker *F. R. S. to the* Preſident, *containing Abſtracts of ſeveral Obſervations of* Auroræ Boreales *lately ſeen.*

SIR,

Read June 28, 1750.

ON *Monday* the 23d of *January* laſt, ſome unuſual Appearances were obſerved in the Sky, at *London*, and the Towns about it,

---

(1) *Vaillant* has given us the impreſſion of an head upon a ſilver tetradrachm, with this title placed over it, *Nicomedes Epiphanes rex Nicomediae*; whom he takes to have been the grandfather of *Pruſias ad Achemenem*. *imp. Tom.* II. *p.* 304. And Dr. *Mead* has ſuch a coin in his collection, with theſe words on the reverſe, ΒΑΣΙΛΕΩΣ ΕΠΙΦΑΝΟΥΣ ΝΙΚΟΜΗΔΟΥΣ. Where *Epiphanis* the *cognomen* ſtands firſt, as it ſometimes does in antient writers: *Cic. Orat. c.* 27. An impreſſion alſo of a ſimilar coin, with the head on one ſide, and the ſame legend on the other, may be ſeen among the *Numiſmata Pembroch. Par.* II. *tab.* 69. But *Vaillant* ſais, that he had not met with any coin, which had on it the head of *Nicomedes Epiphanes* the ſon of *Pruſias*, to whom the inſcription refers, which is cut on the ſtone. *Ubi ſupra, pag.* 355.

it, by Thouſands of People during the whole Evening, of which ſome Accounts were laid before the *Royal Society:* And as Appearances of the like kind were obſerved in the Heavens, the ſame Evening, at great Diſtances from *London,* I take the Liberty to preſent you a Deſcription of what was ſeen at the City of *Norwich,* by Mr. *William Arderon* F. R. S.; and alſo of what was obſerved at *Wells* (a little Sea-Port Town in the ſame County of *Norfolk,* about 30 Miles nearly due North from *Norwich*) by Mr. *Joſeph Sparſhal,* and ſent by him to Mr. *Arderon,* who communicated it to me.

An Account of the Aurora Borealis *ſeen at* Norwich, Jan. 23, 1750. *by Mr.* William Arderon.

THE wonderful Appearances of the *Aurora Borealis* on the 23d of *January* laſt, have been taken notice of in moſt Parts of *England,* tho' in different Forms. At *Norwich* I believe it was as extraordinary as at any Place whatever: But the Weather being very cold, and myſelf ſomewhat indiſpoſed, I did not make all the Remarks I could have wiſhed: The few I did make are as follow:

This wonderful *Aurora* began at 6 o' Clock in the Evening, with a blackiſh Cloud in the N. E. out of which ſprung up a Streak of ſcarlet-colour'd Rays, of a ſurpriſing Beauty and Vividneſs. This preſently extended to within a few Degrees of the S. W. Horizon, paſſing directly thro' the *Zenith,* and ſo continuing near a Quarter of an Hour, when red and yellow Columns began to riſe upwards from every Quarter.

At

At 7 o' Clock a black Cloud roſe up in the S. E. and quickly put on a ſemicircular Form, with light yellowiſh Vapours aſcending out of its upper Edge, and repreſenting a Glory of an uncommon Brightneſs.

At 8 o' Clock the black Cloud was diſperſed, but the yellow Glory remained; and round that ſprang up another Circle of Red, which made the whole appear very tremendous.

The reddiſh Streams, as well as this laſt-mention'd Circle, were ſometimes ſo denſe, that even Stars of the firſt Magnitude could not be ſeen thro' them.

There was now-and-then ſome of the flaſhing *Aurora* in different Parts of the Firmament, tho' not ſo common as I have obſerved at other times.

The Night was full as light as it is when the Moon is about eight Days old; but I could compare it neither to the Light of the Sun nor Moon, ſome of the original Colours ſeeming to be wanting: And the beſt Deſcription I can give of it is, to liken it to that Light produced in a dark Room, when one of the ſeven original Colours is ſeparated from the reſt, after they have paſſed thro' a Priſm, and been collected together again by a convex Lens.

This Evening the Barometer was 30.1 falling. *Haukesby*'s Thermometer 63. Wind E. $\frac{2}{10}$ Force. The Morning miſty, and very cold, but all the Day clear.

Part of a Letter from Mr. Joſeph Sparſhal, *of* Wells, *concerning thoſe* Lights *in the Heavens, ſeen* Jan. 23, 1749-50. *to Mr.* William Arderon *at* Norwich.

ON *Tueſday Jan.* 23, the Air at *Wells* was clear and ſerene during the greateſt Part of the Day, with a freſh Breeze of Wind at S. S. E. which terminated in an Evening extremely remarkable for Appearances in the Heavens of an uncommon *Aurora Borealis*.

At 15 Minutes paſt 5, I firſt took notice of the Foot of an Arch, which formed an Angle of about ten Degrees with the N. E. Part of the Horizon. This Arch ſhot out pointed Streams like Pyramids, of a fiery red Colour, which generally aſcended within a few Degrees of the *Zenith*, then vaniſhed, and were immediately ſucceeded by others, from the N. E. where the principal Magazine ſeemed to be. They continually ſhifted towards the E. and S. W. with ſudden Flaſhings and Dartings; but towards the Weſt the Appearances ſeldom altered.

At 30 Minutes paſt 5, a luminous Stream, of a bright Flame-Colour, ſhot up on the N. Side of the fiery Arch, which ſtill kept ſomewhat of that Form, tho' frequently interrupted by ſhooting Flaſhes from the N. E.

At 40 Minutes paſt 5, there appeared ſuddenly in the N. E. an elliptical *Corona*, of an amazing Brightneſs, elevated about 9 Degrees above the Horizon, and having its longeſt Diameter parallel thereto. There ſhot up perpendicularly from this Streams reſembling

ſembling Columns of Flame intermixed with others of bright Red.

At 50 Minutes paſt 5, Part of the Hemiſphere, included between the N. E. and S. E. was ſtrongly illuminated, with a vaſt Number of pointed Rays of Crimſon and Flame-colour, darting towards the *Zenith*. Theſe vaniſhing in about four Minutes, were ſucceeded by many whitiſh Streaks, ſhifting from the N. to the S. E.

At 55 Minutes paſt 5, there ſprang up in the N. three bright Pyramids of Flame-Colour, aſcending to the Height of about 70°, not perpendicular to the Horizon, but inclining towards the E. and theſe were joined at the upper Parts by an equal Number of a blood-red Colour from the S. E.

At 6, a Pyramid of a crimſon Colour roſe from the N. E. to the Height of about 60°. This ſoon diſappeared; but a diffuſed Redneſs remained; and from the N. E. to the S. W. appeared an Arch, crowned at the *Vertex* with ſomething reſembling a Glory, with a round Body of Light in its Centre.

At 20 Minutes paſt 6, the Redneſs was contracted into a narrower Compaſs, but was much deeper in Colour, forming an Arch from S. E. to S. W. and appeared at the *Zenith* like a fiery Sheet ſpread towards the South; the North being at the ſame time illuminated with white Streams, like the common *Aurora Borealis*.

At 30 Minutes paſt 6, a whitiſh ſemicircular Arch was formed to the Southward, encompaſſing the red Lights in the *Zenith*, and extending from the E. to the S. W. But this Appearance continued only a few Moments.

At

At 40 Minutes paſt 6 the Redneſs quite diſappeared in the N. E. and that to the Southward became much paler. The common *Aurora* appeared very plain in the N. E. till 7 o'Clock, and then totally diſappeared.

At 8 the common *Aurora* appeared again very bright from N. to E.

At 30 Minutes paſt 8 appeared another large ſemicircular Arch, extending from E. to W. pointed Columns of a bright Red ſhooting up from each Side of its Baſe; with other ſmaller ones on the upper Part of it, ſuch as the common *Aurora*. At the ſame time aroſe in the North, from within a very few Degrees of the Horizon, a bright pyramidal Stream of Light, of a ſurpriſing Magnitude. This Appearance continued near a Quarter of an Hour very regular, and exceeding beautiful.

At the Beginning of theſe Lights the Mercury ſtood at 29.9, but quickly fell to 29.8. The Wind at S. E. $\frac{7}{10}$ Force.

During Part of the Time I obſerved an uncommon Motion in the magnetic Needle; but was too cloſely engaged in obſerving the Heavens to take much notice of it.

I ſaw this Evening thoſe Meteors called falling Stars; particularly ſome, which, on taking Fire, left a long Train of Sparks behind them.

My Situation being quite open to the Sea on all Sides, except the South, afforded me as favourable an Opportunity of viewing the above Particulars as I could wiſh; and I gave up my whole Attention to them.

Having

Having laid theſe Accounts before you, permit me the Honour to be,

SIR,

Catherine-Street, June 18. 1750.

Your moſt obedient humble Servant,

H. Baker.

XVIII. *A Deſcription of a* Mariner's Compaſs *contrived by* Gowin Knight, *M.B. F.R.S.*

Read July 5. 1750.

THE Diſcovery of the Mariners Compaſs has probably been of more general and important Uſe to human Society, than the Invention of any one Inſtrument whatſoever: And yet ſo far have they been from ſtudying the Improvement of it, that there would be no Abſurdity in ſuppoſing that the firſt which was made might be as much ſuperior to thoſe in common Uſe now, as the moſt improved Inſtrument we have is ſuperior to its firſt Contrivance.

The Compaſs which appeared before this *Society* laſt Year, on account of its being render'd uſeleſs by Lightning *, was what afforded me the firſt Idea of their Imperfections, ſome of which I then enumerated; but others have ſince occurred to me, ariſing from the Structure of the Needle, which I had not ſufficiently conſidered at that time. It was then obſerved, that almoſt all the Compaſſes on board our Merchant-

---

* See theſe *Tranſactions*, N°. 492, *p.* 111.

Merchant-Ships had their Needles formed of two Pieces of ſteel Wire; each of which was bent in the middle, ſo as to make an obtuſe Angle; and their Ends, being applied together, make an acute one; ſo that the Whole repreſents the Form of a Lozenge; in the Centre of which, and of the Card, is placed the braſs Cap. I procured twenty Cards, with Needles of this kind fixed to them; and after touching them with a Pair of large Bars, I tried each of them, with the ſame Cup and Pin, by drawing them aſide 90 Degrees from the true Point, and then ſeeing where they would reſt. I found them all to vary more or leſs, either to the Eaſt or Weſt; and ſome of them as far as 8 Degrees. Few of them came to the ſame Degree twice together; and when they did, that was never the true Point. In ſhort, they not only varied from the true Direction, but from one another, and from themſelves. I then tried, by drawing them gently aſide, how far I could make them ſtand from the true Point, without returning; and found they might frequently be made to do it at the Diſtance of a whole Point on either Side. One of them, which generally varied 6 or 7 Degrees to the Eaſt, being drawn the ſame Way, would ſtand at 16 Degrees.

All theſe Irregularities are owing to the Structure of the Needle: For the Wires, of which it is compoſed, are only hardened at the Ends; and that is done by making the Ends red hot, and quenching them in Water: If all theſe Ends are not equally hard, or if one End be hardened higher up than the other, when they come to be put together, in fixing them to the Card, that End which is hardeſt, will deſtroy much

much of the Virtue of the other; by which means the hardeſt End will have moſt Power in directing the Card, and muſt conſequently make it vary towards its own Direction. If you retouch theſe Wires when fixed to the Card, the Error will ſtill remain; for that Wire which is beſt hardened will always become the ſtrongeſt. Conſidering how uncertain this Method of hardening the Ends of the Wires muſt be, it is a great Chance if they ſhould once in an hundred times be equally and uniformly hard: And unleſs they are, the Card to which they are fixed muſt neceſſarily vary.

The Wires being diſpoſed in the Form of a Lozenge, is the Reaſon why theſe Cards had ſo little Force, that they might be made to ſtand at the Diſtance of ſeveral Degrees, on either Side the Point from whence they were drawn. For all magnetical Bodies receive an additional Strength, by being placed in the Direction of the Earth's Magnetiſm, and act proportionably leſs vigorouſly when turned out of it. Wherefore, when theſe kind of Needles are drawn aſide from their true Point, two of the parallel Sides of the Lozenge will conſpire more directly than before with the Earth's Magnetiſm; and the other two will be leſs in that Direction: By which means the two firſt Sides will very much impede its Return; and the two latter will have that Impediment to overcome, as well as the Friction, by their own Force alone.

The Needles that are uſed on board the Men of War, and ſome of the larger trading Ships, are made of one Piece of Steel, of a Spring Temper, and are broad towards the Ends, but tapering to-

wards the Middle, where a Hole is made to receive the Cap. At the Ends they terminate in an Angle greater or leſs, according to the Skill or Fancy of the Workman. Now, tho' the worſt of theſe are infinitely preferable to thoſe of Wire, yet the beſt of them are far from being perfect. Every Needle of this Form has 6 Poles inſtead of two. There is one at each End, two where it becomes tapering, and two at the Hole in the Middle. This is owing to their Shape; for the middle Part being very ſlender, it has not Subſtance enough to conduct the magnetic Stream quite through from one End to the other. All theſe Poles appear very diſtinctly, when examined with a Glaſs that is ſprinkled over with magnetic Sand. Nevertheleſs this Circumſtance does not hinder the Needle from pointing true; but as it has leſs Force to move the Card, than when the magnetic Stream moves in large Curves from one End to the other, it is certainly an Imperfection.

I examined an hard Needle of this ſort, whoſe Ends were very broad, and terminated in an acute Angle; and obſerved, that, tho' its Motion was very free and vigorous, yet I could make it ſtand one Degree on either Side the true Point; and being at a Loſs to account for it, I tried what Appearance it would make under a Glaſs with magnetic Sand, and diſcover'd that the magnetic Stream came out of the Sides, which formed the acute Angle at the Ends, in Lines that were almoſt perpendicular to thoſe Sides, and then was bent round to go to the other Pole: From whence I concluded, that when the Needle was drawn a little from the true Point, the Stream, which came out of one of theſe Sides, would

would be more in the Direction of the Earth's Magnetiſm than before; on which account it would act ſtronger in retaining the Needle in that Situation, than the Stream of the other Side in reſtoring it; eſpecially as that Stream would be now weaker, on account of its being turned out of the magnetical Line, and would have the Friction betwixt the Cap and Pin to overcome at the ſame time.

I tried two other Needles, whoſe Ends were formed into Angles very obtuſe, and could not find that they were liable to the ſame Objection.

Two Needles, that were quite ſtrait, and ſquare at the Ends, were found to have only two Poles; but about the Hole in the Middle the Curves were a little confuſed. Theſe always came exactly to the ſame Point, after vibrating a long time; and if drawn never ſo little on one Side, would return to it again without any ſenſible Difference. We may therefore conclude, that a regular Parallelopiped is the beſt Shape for a Needle, as well as the ſimpleſt; with the Holes for the Caps as ſmall as can well be contrived; or if it can be made to anſwer the Purpoſe without any Hole at all, it will be ſtill more perfect.

Yet the common Shape has one Advantage which this has not: For, being made broad at the Ends, and ſlender in the Middle, its Weight is removed as far as poſſible from the Centre: On which account, if it once points true, the Friction at the Centre cannot ſo eaſily put it in Motion; and its Vibrations, when in Motion, will be ſlower; ſo that their Limits may be more nicely obſerved, and the middle Point betwixt them is that where it would

ſtand, if at reſt. Being unwilling to part with theſe Advantages, I contrived a light Circle of Braſs, of the ſame Diameter with the Card, which will ſupply a Weight acting at the greateſt Diſtance from the Centre of Motion, and alſo ſerve to ſupport the Card; which may now be made of thin Paper, without any thing to ſtiffen it. So that the extraordinary Weight of the braſs Ring is compenſated in a great meaſure by the Lightneſs of the Card. This Ring is of Service in another reſpect; for, being fixed below the Card, and the Needle above it, the Centre of Gravity is placed low enough to admit of the Cap being put under the Needle; whereby the Hole in the Needle becomes unneceſſary; and the latter being placed above the Card, renders it eaſier to be touched with a Pair of Bars.

Having thus completed the Needle and Card to my Satisfaction, what chiefly remains, is, to contrive ſuch a Cap and Point as will have the leaſt Friction, and be moſt likely to continue in a State of Perfection. The Caps in Uſe are either of Braſs, a mixed Metal, like that of a reflecting Teleſcope, Cryſtal, or Agate. The two firſt will only admit of braſs Points, and the latter are rather too expenſive for common Uſe. Wherefore I bethought myſelf of trying glaſs Caps: I had three of them made by a Glaſs-blower, two of which I got poliſhed: They were all ſet in Braſs, ſo as to ſcrew into the ſame Needle, which had alſo one of Agate fitted to it. I compared them with that of Agate, by trying with each of them how many Vibrations the ſame Card and Needle would make, when drawn aſide 90 Degrees,

Degrees, on the ſame Point; which was a very ſmall ſewing Needle.

The Number of Vibrations with the Agate Cap, on the firſt Trial, were 39, then 37, then 39 again; with one of the glaſs Caps it made 23, and then 20. This Difference from the Agate Cap was ſo great, that I concluded the Point muſt be damaged, and therefore choſe a finer; on which the ſame glaſs Cap made 41 Vibrations; then 43; and another glaſs Cap made 47, and the next time 43. But the Agate Cap with this Point made 51, 57, and 58 Vibrations. The unpoliſhed glaſs Cap performed much the ſame with the others. I had two of them poliſhed again by Mr. *Smeaton*; and in Company with him repeated the ſame Experiments; but with no better Succeſs. The Agate Cap made always many more Vibrations than the glaſs one; and generally with the latter the Number diminiſhed by repeated Trials; whereas with the Agate Cap it uſually increaſed.

Theſe Experiments made me lay aſide the Thoughts of glaſs Caps, and put me upon thinking how Agate ones might be made with as little Expence as poſſible.

With this View I got a Cap turned of Ivory, in ſuch a manner as to receive a ſmall Bit of Agate at the Top. This being ground concave, and poliſhed on that Side, where it formed the *Apex* of the hollow Cone in the Cap, was capable of anſwering the Purpoſe as well as if the Whole had been Agate, and was much lighter. Theſe Caps may be made cheap enough for common Uſe; and, if good at firſt, cannot eaſily be impaired.

For

For a Point, I chose a common sewing Needle, and contrived to fix it in such a manner as to be taken out with the greatest Ease, and replaced by another, if necessary; by which means an excellent Point may be always had with little Trouble or Expence. Common Needles, when well temper'd, have all the Qualifications that can be desired for the Purpose intended. The smallest are strong enough to bear the Weight of a Card; and are neither so soft as to be liable to bend, nor so hard and brittle as to break; and they are generally better pointed than any that a common Workman could pretend to make *extempore*.

Thus we have gone through all the Parts that are essential to a Mariner's Compass; and endeavoured to put them upon such a Footing, as to leave as little Room as possible for Error in their first Construction, or Failure in the long continued Use of them.

This, which I have now the Honour to exhibit to the *Society*, was made by Mr. *Smeaton*, a Gentleman whose uncommon Skill in the Theory and Practice of Mechanics has enabled him to execute whatever I proposed in such a manner as always to exceed my Expectations: And not only so, but he has added a considerable Improvement of his own. By a very simple Contrivance he has made the same Instrument capable of serving the Purposes of an Azimuth and Amplitude Compass; and that in a manner much preferable to any thing hitherto contrived; the Description and Use of which he has drawn up himself, for the Perusal of the *Society*.

XIX. *An Account of ſome Improvements of the* Mariners Compaſs, *in order to render the* Card *and* Needle, *propoſed by Doctor* Knight, *of general Uſe, by* John Smeaton, *Philoſophical Inſtrument-maker.*

Preſented July 5, 1750. *here printed with Alterations.*

THE Cover of the wooden Box being taken off, the Compaſs is in a Condition to be made uſe of in the Bittacle, when the Weather is moderate: But if the Sea runs high, as the inner Box is hung very free upon its Centres (the better to anſwer its other Purpoſes) it will be neceſſary to ſlacken the mill'd Nut, placed upon one of the Axes that ſupports the Ring, and to tighten the Nut on the Outſide that correſponds to it. By this means the inner Box and Ring will be lifted up from the Edges, upon which they reſt, when free; and the Friction will be increaſed, and that to any Degree neceſſary to prevent the too great Vibrations; which otherwiſe would be occaſioned by the Motion of the Ship.

To make the Compaſs uſeful in taking the magnetic Azimuth, or Amplitude of the Sun and Stars, as alſo the Bearings of Head-lands, Ships, and other Objects at a Diſtance, the braſs Edge, deſigned at firſt to ſupport the Card, and throw the Weight thereof as near the Circumference as poſſible, is itſelf divided into Degrees and Halves; which may be eaſily eſtimated into ſmaller Parts, if neceſſary.

The

The Diviſions are determined by means of a Cat-gut Line ſtretched perpendicularly with the Box as near the braſs Edge as may be, that the Parallax ariſing from a different Poſition of the Obſerver may be as little as poſſible.

Underneath the Card are two ſmall Weights, ſliding on two Wires, placed at right Angles to each other; which, being moved nearer to, or farther from the Center, counterbalance the Dipping of the Card in different Latitudes, or reſtores the *Equilibrium* of it, where it happens by any other means to be got too much out of Level.

There is alſo added an *Index* at the Top of the inner Box, which may be put on and taken off at pleaſure, and ſerves for all Altitudes of the Object. It conſiſts of a Bar, equal in Length to the Diameter of the inner Box; each End being furniſhed with a perpendicular Stile, with a Slit parallel to the Sides thereof. One of the Slits is narrow, to which the Eye is applied, and the other is wider, with a ſmall Catgut ſtretch'd up the Middle of it, and from thence continued horizontally from the Top of one Stile to the Top of the other: There is alſo a Line drawn along the upper Surface of the Bar. Theſe four, *viz.* the narrow Slit, the horizontal Catgut Thread, the perpendicular one, and the Line on the Bar, are in the ſame Plane, which diſpoſes itſelf perpendicular to the Horizon, when the inner Box is at reſt, and hangs free. This *Index* does not move round, but is always placed on ſo as to anſwer the ſame Side of the Box.

When the Sun's Azimuth is deſired, and his Rays are ſtrong enough to caſt a Shadow, turn about the wooden Box, till the Shadow of the horizontal

horizontal Thread; or (if the Sun be too low) till that of the perpendicular Thread in one Stile, or the Light through the Slit in the other, falls upon the Line on the *Index* Bar, or vibrates to an equal Diſtance on each Side of it, gently touching the Box, if it vibrate too far: Obſerve at the ſame time the Degree marked upon the braſs Edge by the catgut Line. In counting the Degree for the Azimuth, or any other Angle that is reckon'd from the Meridian, make uſe of the outward Circle of Figures upon the braſs Edge, and the Situation of the *Index* Bar, with regard to the Card and Needle, will always direct upon what Quarter of the Compaſs the Object is placed.

But if the Sun does not ſhine out ſufficiently ſtrong, place the Eye behind the narrow Slit in one of the Stiles, and turn the wooden Box about, till ſome Part of the horizontal or perpendicular Thread appears to interſect the Centre of the Sun, or vibrate to an equal Diſtance on each Side of it, uſing ſmoked Glaſs next the Eye, if the Sun's Light is too ſtrong. In this Method another Obſerver will be generally neceſſary to note the Degree cut by the *Nonius*, at the ſame time the firſt gives notice that the Thread appears to ſplit the Object.

From what has been ſaid, the other Obſervations will be eaſily performed; only in caſe of the Sun's Amplitude, take care to number the Degiee by the Help of the inner Circle of Figures on the Card, which are the Complements of the outer to 90, and conſequently ſhew the Diſtance from Eaſt or Weſt.

The Azimuth of the Stars may alſo be obſerved by Night; a proper Light ſerving equally for one Obſerver to ſee the Thread, and the other the Degree upon the Card.

It may not be amiſs to remark farther, that, in caſe the inner Box ſhould loſe its *Equilibrium*, and conſequently the *Index* be out of the Plane of a vertical Circle, an accurate Obſervation may ſtill be made, provided the Sun's Shadow is diſtinct: For, by obſerving firſt with one End of the *Index* towards the Sun, and then the other, a Mean of the two Obſervations will be the Truth.

Explanation of the Figures.

Fig. 1. is a perſpective View of the Compaſs, when in Order for Obſervation. The Point of View being the Centre of the Card, and the Diſtance of the Eye two Feet.

AB, is the wooden Box.

C and *D* are two mill'd Nuts; by means whereof the *Axes* of the inner Box and Ring are taken from their Edges, on which they move, and the Friction increaſed, when neceſſary.

EF is the Ring that ſupports the inner Box.

GH is the inner Box; and

I is one of its *Axes*, by which it is ſuſpended on the Ring *EF*.

KL is the Magnet or Needle; and

M a ſmall Brace of Ivory, that confines the Cap to its Place. See *Fig.* 2.

The Card is a ſingle varniſhed Paper, reaching as far as the outer Circle of Figures, which is a Circle of

of thin Braſs, the Edge whereof is turned down at right Angles to the Plane of the Cardto make it more ſtiff.

O is a catgut Line drawn down the Inſide of the Box; for determining the Degree upon the braſs Edge.

PQRS is the *Index* Bar, with its two Stiles and Catgut Threads; which being taken off from the Top of the Box, is placed in two Pieces, *T* and *V*, notched properly to receive it.

W is a Place cut out in the Wood, ſerving as an Handle.

Fig. 2. is the Card *in plano* with the Needle fixed upon it; being one Third of the Diameter of the real Card.

Fig. 3. is a perſpective View of the Backſide of the Card, where

AB repreſents the turning down of the braſs Edge.

C is the under Part of the Ivory Cap.

D and *E* are the two ſliding Weights to balance the Card; and

F and *G*, two Screws that fix the braſs Edge, *&c.* to the Needle.

Fig. 4. is the Pedeſtal that ſupports the Card, contained a ſowing Needle, fixing in two ſmall Grooves to receive it, by means of the Collet *C*, in the manner of a Port-Creyon. At *D* the Stem is filed into an Octagon, that it may be the more eaſily unſcrew'd.

XX. *The Deſcription of a* Fiſh, *ſhewed to the* Royal Society *by Mr.* Ralph Bigland, *on* March 22, 1749-50: *Drawn up by* C. Mortimer, *M. D. Secret. R. S.*

Read July 5, 1750. THIS Fiſh is ſmooth-skinn'd, has no Scales, nor Teeth. It has one erect Fin on its Back, which ariſes below its Neck, and runs within a little of its Tail. On each Side about the Middle, between its Back and Belly, behind the Gills is a Fin: From the Bottom and Middle of its Belly, a little forward of the Vent, ariſe a Pair of Fins: From behind the Vent runs one Fin, within a little of the Tail: The Tail-Fin is large and forked. Its Eyes are large; the *Irides* are ſcarlet, encompaſſed with a Circle of a gold Colour verged with ſcarlet. Its Noſtrils are placed above its Eyes. The Back, and upper Part of the Body quite to the Tail, was of a dark blue, or violet Colour; theſe, and the Sides of the Body, which were of a bright green, were all ſpeckled with oblong white Spots; the Chaps were of a pale red; the Noſe, Gills, and Belly, were of a ſilver Colour; and all the Fins of a bright ſcarlet.

It was 3 Feet 7 Inches long, and 3 Feet 10 Inches round in the thickeſt Part. It weighed 82 Pounds. Its Mouth is ſmall; its Tongue was thick, almoſt like a human Tongue in Shape, but rough, and thick-ſet with Beards or Prickles, which pointed backwards; ſo that any thing might eaſily paſs down, but could not eaſily ſlip back again; therefore theſe might ſerve inſtead of Teeth for retaining its Prey or Food. Its Gills reſemble thoſe of a Salmon. Its Body grows very

very taper towards the Tail; and, from being compreſſed to 10 Inches Thickneſs, becomes near the Tail almoſt round, and about 3 Inches thick. The whole Shape of this Fiſh much reſembles the Sea-bream; but it differs in Size, being much larger, and in not having Teeth nor Scales. The Fin ſtanding erect on the Back, has ſome *Aculei* next the Neck, and riſes up 8 Inches; but in the Middle diminiſhes to 1 Inch; and near the Tail riſes again to about 3 Inches. The Belly-Fin oppoſite to this ſpreads 3 Inches near the Tail, and diminiſhes towards the Vent. The Tail-Fin is forked, and ſpreads 12 Inches. The Gill-Fins are 9 Inches long, and 3 wide at their Baſis. The 2 Belly-Fins were 11 Inches long, and 3 wide at their Baſis. It ſeems to me to be a new Species of Fiſh, not yet deſcribed by any Author.

The black Prince, and his Couſin, from *Anamaboe* on the Coaſt of *Guinea*, and Mr. *Creighton*, formerly Governor of *Capo Corſo Caſtle*, upon ſeeing this Fiſh immediately knew it, and ſaid it was common on that Coaſt, and is very good to eat. The Natives call it *Opah*, and the *Engliſh* there call it the *King-fiſh*. I ſhall therefore retain the *Guinea* Name, with theſe Characteriſtics; OPAH Guinienſium *eſt piſcis oſſeus, non ſquammoſus, edentulus; habens unicam in dorſo pinnam anteriùs aculeatam, pone branchias par pinnarum, in medio ventre par pinnarum, ad poſticam ventris partem unicam pinnam, caudam forcipatam.*

Mr. *Bigland* ſays, that, upon opening of it, all its Bowels would have gone into a Quart-Mug; that the Fleſh of the fore Part was firm, and look'd like Beef, and the hinder Part like fine Veal; that the Bones were like thoſe of Quadrupeds; particularly the

the Shoulder-blades, which reſembled thoſe of Sheep. [See an Article in the *Scots Magazine* for *October* 1748. printed at *Edinburgh* in 8*vo.*] In a Letter to me, he adds, that probably this was a [Pelagian or] Ocean Fiſh, wandring by chance into the Frith of *Forth*; and, by the Tide ebbing, being left upon a conſiderable Shoal, or flat Sand, near *Leith*, was diſcover'd from Land in a State of Diſtreſs; whereupon ſome Fiſhermen plunged into the Sea, and with a Net ſurrounded it, and brought it to Shore.

XXI. *A Letter from* John Burton *M. D. to* C. Mortimer *M. D. & Secr. R. S. concerning the* Extirpation *of an* Excreſcence *from the* Womb.

SIR,

Read July 5. 1750. I HAVE at laſt got a Drawing of an Excreſcence * growing from the Inſide of the *Os Tincæ* on the right Side; which I herewith ſend you, (ſee TAB. I. *Fig.* 6.) along with as full and perfect an Account of the Caſe as I can.

The Wife of one *Chapman*, a Whiteſmith, at *Selby*, ten Miles off, upwards of ſeven Years ago lay in of her laſt Child, and had a tolerable eaſy Labour: Soon after which, ſhe had what ſhe called the *Fluor albus*, that continued ever ſince, and increaſed upon her; inſomuch that ſhe ſays, ſhe has ſometimes

* It is exactly the Dimenſions of the Original, which weighed 5 Ounces and a half. That Part below the pricked Line appeared out of the *Vagina*; that above reach'd from the *Labia* to the *Os Uteri*.

ſometimes had ſuch a Diſcharge, as to wet the Place ſhe ſat upon thro' all her Petticoats, *&c.*

For ſome Months before we were concerned for her, ſhe began to complain of a Pain and Weight in the *Uterus*; which increaſed as the Subſtance grew in Bulk; and at laſt the Excreſcence was ſo large as to appear outwards, and then it grew very faſt.

The Patient conſulted her Midwife, who thought the Womb had come out; but was ſo prudent as not to do any thing; and deſired they would call in better Advice. Accordingly they ſent for Mr. *Fell*, an eminent Man-midwife and Surgeon in this City; who, not having met with a Caſe like that, deſir'd me alſo to go and ſee her; which was in *December* laſt (1749). The Subſtance not only fill'd, but extended, the Entrance into the *Vagina*. I introduced a Finger into the Paſſage, and ſoon found the Excreſcence to be leſs in Bulk there than what appear'd without the Body; and to be in Shape as you ſee in the Drawing. I follow'd the Subſtance till I reach'd the *Os Uteri*, which I found chiefly fill'd up, with the Neck or ſmalleſt Part of this Subſtance, leaving only a ſmall Part of the *Os Tincæ* to be perceived on the left Side, obliquely towards the Back. I tried to penetrate the *Os Tincæ* with the End of my Finger, but could not; however, I ſo far open'd it, as to let out a ſort of bloody *Ichor*, which was a little offenſive in Smell.

I asked her, if, when her Diſcharges were ſo large as to wet her Seat, they differ'd in Smell from thoſe which came in leſs Quantities; and if they ſmelled ſomething like what then came from her when I ſearched her, which ſhe anſwer'd in the Affirmative: From whence I concluded ſhe had an Ulcer

cer just within the *Os Uteri*, from the Edge of which this *Fungus* or Excrescence grew. The Patient complain'd of Pain in the *Uterus* and Back, was very faint, and frequently was provoked to vomit, with a feeble Pulse, and sometimes Sweat.

Upon Consultation, we thought proper to tie a Ligature as high up within the *Vagina* as the Surgeon could reach: Which being done, and some internal Medicines being order'd, we return'd home; and in two or three Days we went again, but found no great Alteration as to the uterine Complaint; except that the Part below the Ligature was somewhat more livid, and the fetid Smell was much greater, and very like that of a confirmed running Cancer: And as the Matter was somewhat confin'd in the Passage, I order'd them to wash the *Vagina* by an Injection made of the common emollient Decoction, with *Mel Rosarum* and a little *Tinct. Myrrhæ*. This was frequently done; by which the Smell was less offensive; and two Days after the Excrescence dropp'd off at the Ligature.

The Patient has since, in part, recover'd her Strength; tho' she is not in a good State of Health, and her *Fluor albus*, as she calls it, is still troublesome to her.

This was the last Account I have had of her. The Excrescence was very solid, of a dark liver Colour, and, whilst adhering to the *Uterus*, was quite insensible. When cut in two, it resembled the solid Substance that is taken out of Cancers. I am,

SIR,

York, *March* 28, 1750.

Your very humble Servant,

John Burton.

July 5. 1750. the SOCIETY adjourned to *Oct.* 25

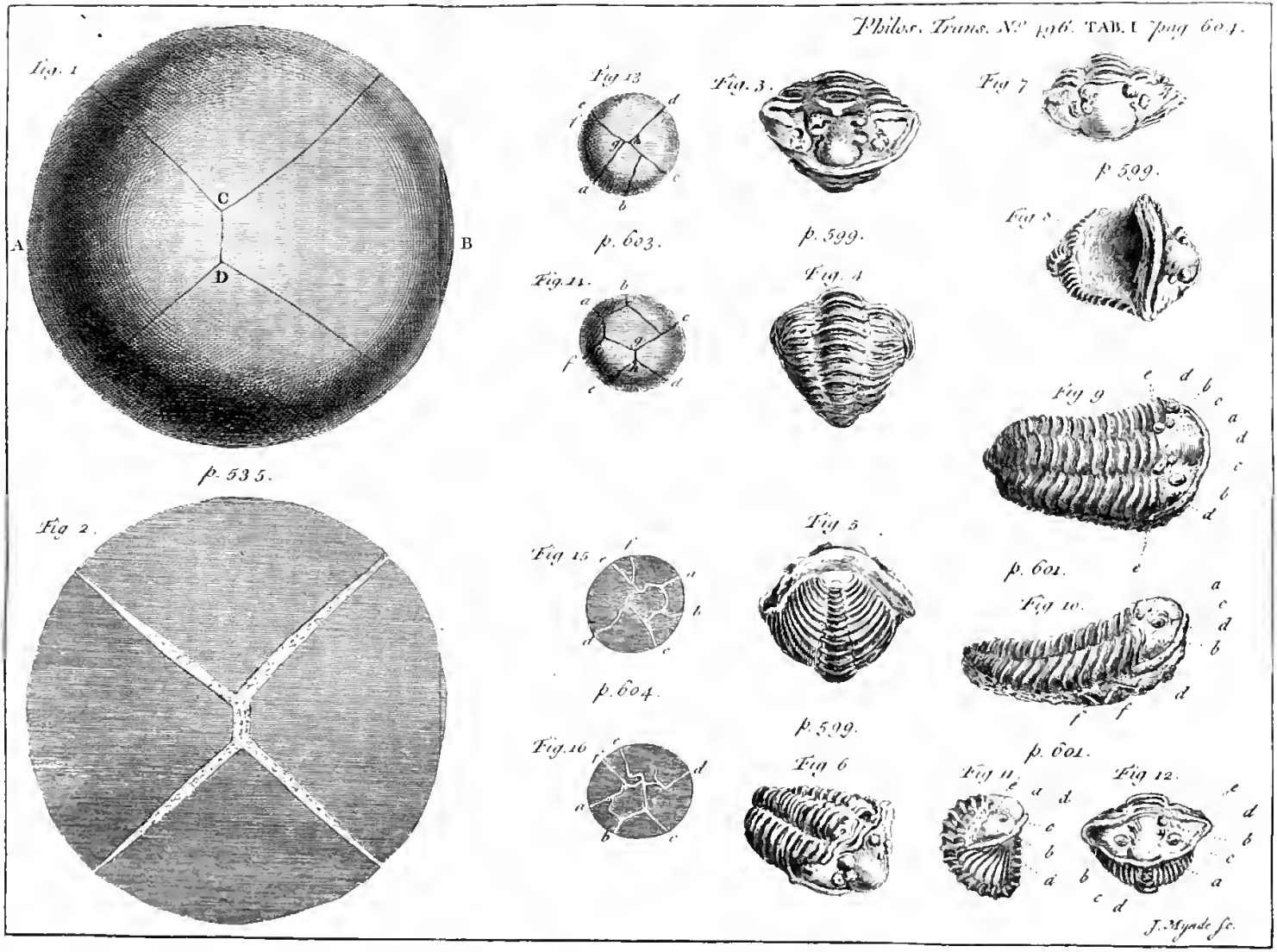
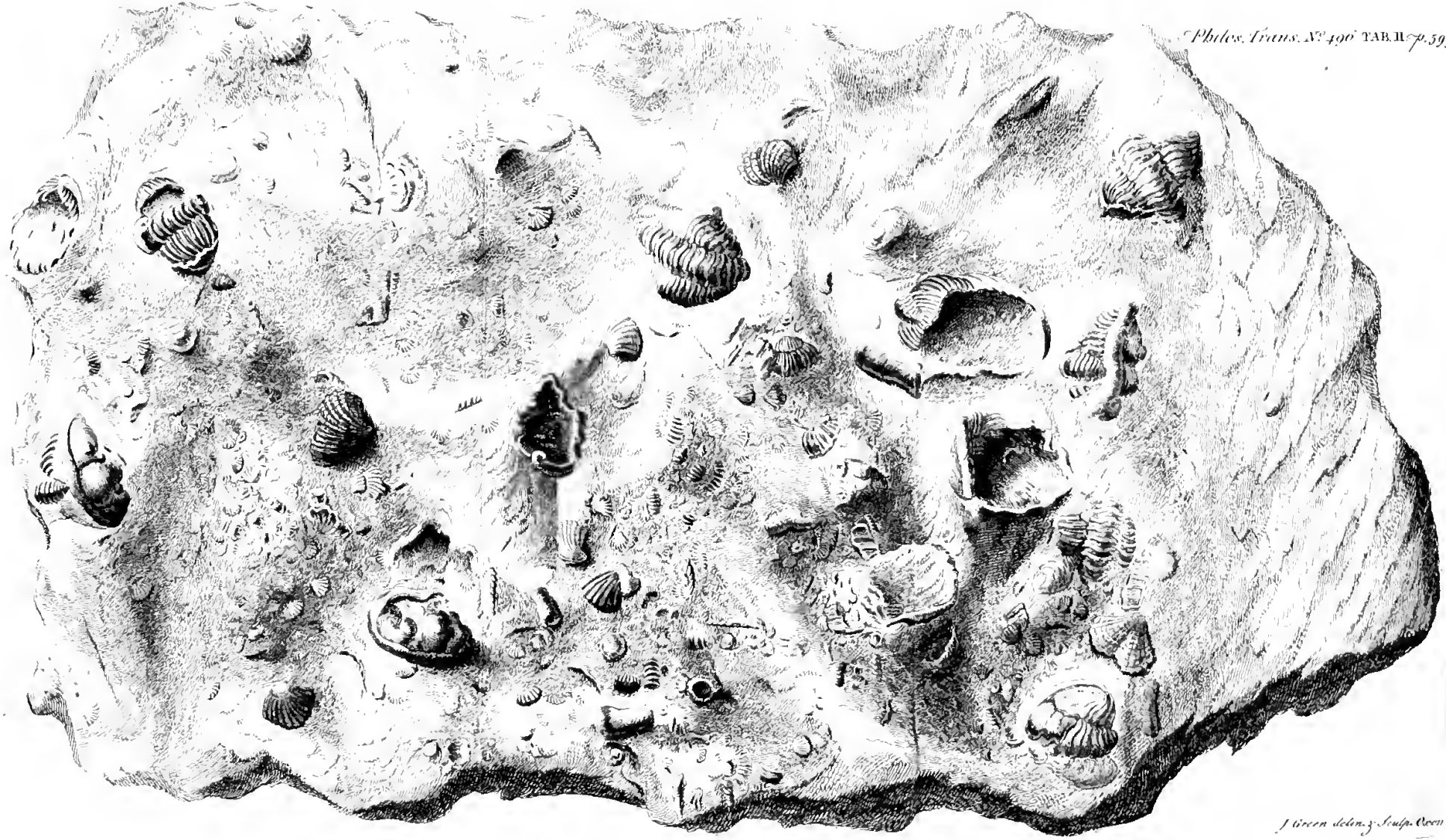


Fig. 1
A
B
C
D
p. 535.
Fig 2.
Fig 13
p. 603.
Fig. 3.
p. 599.
Fig 7
p. 599.
Fig 8.
Fig. 11.
Fig. 4
Fig 9
p. 601.
Fig 15
p. 604.
Fig 5
p. 599.
Fig 10.
p. 601.
Fig. 16
Fig 6
Fig 11.
Fig 12.
J. Mynde sc.



J. Green delin. et Sculp. Oxon.

Numb. 496

PHILOSOPHICAL TRANSACTIONS.

For the Months of *November* and *December*, 1750.

The CONTENTS.

I. *An Account of the* Eclipſe *of the* Moon, June 8, 1750. *obſerved in* Surry-ſtreet *in the* Strand; *by Mr.* John Catlin *and Mr.* James Short, *F. R. S. Likewiſe an Obſervation determining the Longitude of* Kingſton *in* Jamaica. *p.* 523

II. *A Continuation of the Experiments on Subſtances reſiſting* Putrefaction; *by* John Pringle *M. D. F. R. S.* *p.* 525

III. *A Letter from Mr.* Joſeph Platt *to Mr.* Peter Collinſon *F. R. S. concerning a flat* Spheroïdal Stone *having Lines regularly croſſing it.* *p.* 534

IV. *A Letter from* Arthur Dobbs *Eſq; to* Charles Stanhope *Eſq; F. R S. concerning* Bees, *and their Method of gathering* Wax *and* Honey. *p.* 536

V.

V. *Further Experiments on Subſtances reſiſting* Putrefaction; *with Experiments upon the Means of haſtening and promoting it*; *by* John Pringle *M. D. F. R. S.* *p.* 550

VI. *A Letter from Mr.* John Robertſon *to the* Preſident, *containing an Explanation of the late Dr.* Halley's *Demonſtration of the Analogy of the* Logarithmic Tangents *to the* Meridian Line, *or Sum of the* Secants. *p.* 559

VII. Obſervatio Eclipſeos Lunaris totalis cum mora, habita *Wittembergæ*, 1750. die 19 *Junii*, tubo 6 ped. pro correctione horologii, quadrante teleſcopico 18 digitorum, altitudin. Solis correſpondent. die 19 *Junii*, per *G. M. Boſe*, Phyſic. Prof. *Wittembergæ*, &c. *p.* 570

VIII. *Two Letters from the Rev.* Henry Miles *F. R. S. D. D. to Mr.* Henry Baker *F. R. S. concerning the* Heat *of the* Weather *in* July *and* September *laſt.* *p.* 571

IX. *Extract of a Letter from Mr.* William Arderon *F. R. S. to Mr.* Henry Baker *F. R. S. concerning the* hot Weather *in* July *laſt.* *p.* 573

X.

X. *A total Eclipſe of the* Moon, *obſerved* Dec. 2. 1750. *in the Morning, in the* Strand, London, *about* 5″ *of Time Weſt of* St. Paul's, *and* 27″ *Weſt of the* Royal Obſervatory *at* Greenwich; *by Dr.* Bevis *and Mr.* James Short *F. R. S.* *p.* 575

XI. *An Account of ſome Experiments, made by* Benjamin Robins *Eſq; F. R. S. Mr.* Samuel Da Coſta, *and ſeveral other Gentlemen, in order to diſcover the Height to which* Rockets *may be made to aſcend, and to what Diſtance their* Light *may be ſeen; by Mr.* John Ellicott *F. R. S.* *p.* 578

XII. *Several* Papers *concerning a new* Semi-Metal, *called* Platina; *communicated to the* Royal Society *by Mr.* Wm. Watſon *F. R. S.* *p.* 584

XIII. *An Account of a very large human* Calculus, *by* William Heberden *M. D. F. R. S. and Fellow of the* College *of* Phyſicians, London. *p.* 596

XIV. *A Letter from the Rev.* Charles Lyttelton *LL.D. and F. R. S. Dean of* Exeter, *to the* Preſident, *concerning a non-deſcript* petrified Inſect. *p.* 598

XV.

XV. *Some further Account of the before-mention'd* petrified Inſect, *by the* Editor *of theſe* Tranſactions. *p.* 600

XVI. *The Deſcription and Figures of a ſmall flat* ſpheroïdal Stone, *having Lines formed upon it*; *by* C. Mortimer, *M.D. & Secret. R. S.* *p.* 602*

Printed for C. DAVIS, *Printer* to the ROYAL SOCIETY, over-againſt *Gray's-Inn-Gate* in *Holborn.* M.DCC.LI.

I. *An Account of the* Eclipſe *of the* Moon, June 8, 1750. *obſerved in* Surry-ſtreet *in the* Strand; *by Mr.* John Catlin *and Mr.* James Short, *F. R. S. Likewiſe an Obſervation determining the Longitude of* Kingſton *in* Jamaica.

Read Nov. 1. 1750.

WE expected to have ſeen the Moon riſe eclipſed before the Setting of the Sun; but were prevented by Clouds. About half an Hour after 9 o' Clock, we ſaw the Moon then totally eclipſed; tho' conſiderably brighter on the Eaſt than on the Weſt Side; by which we found that ſhe was then paſt the middle of the Eclipſe.

	h	′	″
Emerſion, or End of total Darkneſs, at	9	45	0
End of the Eclipſe at - - -	10	51	30

Here follows a Computation of the ſame Eclipſe by Mr. *John Catlin* from Dr. *Halley's* Tables, which he ſays was done in a Hurry; however he knows of no Error in the Calculation.

	h	′	″
Beginning at - - - -	7	14	25
Immerſion at - - -	8	21	20
True Oppoſition at - - -	9	0	24
Emerſion at - - - -	9	45	52
End at - - - - - -	10	52	53

I take this Opportunity of laying before the *Society* two Obſervations proper for determining the Difference of Longitude between *London* and

Kingſton in *Jamaica*, which came to my Hands ſome time ſince. They were made by *Alexander Macfarlane* Eſq; of *Kingſton* in *Jamaica*, a Fellow of this *Society*, who is provided with a complete *Apparatus* of aſtronomical Inſtruments, which he purchaſed of *Colin Campbell* Eſq;. As this Gentleman is well verſed both in the Theory and Practice of Aſtronomy, I think the following Obſervations may be depended on for fixing the Longitude of *Kingſton*; eſpecially as we have the ſame Obſervations made at the Houſe of Mr. *George Graham* in *Fleetſtreet*, *London*, and already publiſhed in the *Philoſophical Tranſactions*, N°. 471, *p.* 580, 578.

Eclipſe of the Moon, October 22, 1743.

	h	′	″
Beginning of total Darkneſs at - -	9	10	58
End of the Eclipſe at - - -	10	51	33

Tranſit of Mercury *over the* Sun, Oct. 25, 1743.

The Ingreſs of *Mercury* upon the Sun could not be ſeen; the Sun being then below the Horizon.

Exceſſus e diſco Solis, or the laſt exterior Contact, at $7^h\ 56'\ 43''$ *a. m.*

By the firſt Obſervation of the Eclipſe of the Moon, compared with the ſame Eclipſe obſerved here, *Kingſton* is found to be $5^h\ 6'\ 2''$ to the Weſt of *London*.

And by the *Tranſit* of *Mercury* neglecting his Parallax, *Kingſton* is found to be $5^h\ 5'\ 33''$.

This laſt is the moſt to be depended on for ſettling the Longitude of *Kingſton*; becauſe in all Obſervations of an Eclipſe of the Moon, an Error

of a Minute or two may be allowed, ariſing from the Indiſtinctneſs of the *Penumbra*.

II. *A Continuation of the Experiments on Subſtances reſiſting* Putrefaction; *by* John Pringle *M. D. F. R. S.*

Read Nov. 1. 1750. HAVING in my laſt Paper in the preceding Number of theſe *Tranſactions*, *p.* 480, *&c.* juſt mentioned the comparative Force of a few Salts, and other Subſtances reſiſting Putrefaction, I ſhall now lay before the *Society* a more particular Account of thoſe Experiments, with ſome others, ſince made, on that Subject.

1. Three Pieces of the Lean of freſh Beef, each weighing two Drachms, were put ſeparately into wide-mouth'd Phials. Two Ounces of Ciſtern-Water were added to each; in one were diſſolved 30 Grains of Sea-Salt; in another 60; but the third contained nothing but Fleſh and Water. Theſe Bottles were little more than half-full; and, being corked, were placed in a Lamp-Furnace, regulated by a Thermoter, and kept about the Degree of human Heat.

About ten or twelve Hours after, the Contents of the Phial without Salt had a faint Smell; and in three or four Hours more were putrid *. In an Hour

---

* It is to be obſerved, that theſe Pieces were all intire; but when they are beat to the Conſiſtence of a Pap, with the ſame Quantity of Water, the Putrefaction then begins in leſs than half the Time mentioned here.

Hour or two longer the Fleſh with the leaſt Salt was tainted; but that which had moſt, remained ſweet above 30 Hours after Infuſion. This Experiment was often repeated with the ſame Reſult, making Allowance for Variations of the Degree of Heat.

The Uſe of this Experiment was for making Standards, whereby to judge of the ſeptic or antiſeptic Strength of Bodies. Thus, if Water with any Ingredient preſerved Fleſh better than without it, or better than with the Additions of the Salt, that Ingredient might be ſaid to reſiſt Putrefaction more than Water alone, or with 30 or 60 Grains of Sea-Salt. But if, on the other hand, Water, with any Addition, promoted Corruption more than when pure, the Subſtance added was to be reckoned a Septic, or Haſtener of Putrefaction.

The following Experiments were therefore all made in the ſame Degree of Heat with the Quantity of Fleſh, Water, and Air, as above ſpecified; together with ſuch ſeptic or antiſeptic Subſtances, as ſhall be afterwards mention'd, and were all compared with the Standards. But whereas the leaſt Quantity of Salt preſerved Fleſh little longer than plain Water, I ſhall always compare the ſeveral antiſeptic Bodies with the greateſt Quantity of Salt; ſo that whenever any Subſtance is ſaid to oppoſe Putrefaction more than the Standard, I mean, more than 60 Grains of Sea-Salt.

2. I began with examining other Salts, and compared them in the ſame Quantity with the Standard; which being of all the weakeſt, I ſhall ſuppoſe it equal to Unity, and expreſs the proportional Strength of the reſt in higher Numbers in the following Table.

A

A Table *of the comparative Powers of Salts in reſiſting Putrefaction.*

Sea-Salt	1
Sal Gemmæ	1+
Tartar vitriolated	2
Spiritus Mindereri	2
Tartarus ſolubilis	2
Sal diureticus	2+
Crude *Sal Ammoniac.*	3
Saline Mixture	3
Nitre	4+
Salt of Hartſhorn	4+
Salt of Wormwood	4+
Borax	12+
Salt of Amber	20+
Alum	30+

In this Table I have mark'd the Proportions by integral Numbers; it being hard, and perhaps unneceſſary, to bring this Matter to more Exactneſs; only to ſome I have added the Sign +, to ſhew, that thoſe Salts are ſtronger than the Number in the Table by ſome Fraction; unleſs in the three laſt, where the ſame Sign imports that the Salt may be ſtronger by ſome Units†. The Tartar vitriolated is

† Five Grains of Borax was the ſmalleſt Quantity compared with Sea-Salt; but holding out ſo much longer, I ſuſpect three Grains would have been ſufficient; in which Caſe the Force of this Salt was to be eſtimated at 20: A ſingular Inſtance of the Strength of

is rated at 2; tho' more than 30 Grains of it was taken to equal the Standard: But perceiving all of it was not diſſolved, an Allowance was made accordingly. On the other hand, as Part of the Hart's-horn flies off, its real Force muſt be greater than what appears by the Table. The Salt of Amber is likewiſe volatile; and as three Grains of it were found more preſervative than 60 Grains of Sea-Salt; it may therefore be much more than 20 times ſtronger. This is indeed an acid Salt; but as the acid Part of it is inconſiderable, this high antiſeptic Power muſt be owing to ſome other Principle. The *Spiritus Mindereri* was made of common Vinegar and Salt of Hartſhorn; the ſaline Mixture of Salt of Wormwood ſaturated with Lemon-juice. The alcaline Part in either of theſe Mixtures with Water only would have reſiſted with a Power of 4 +; ſo that the Acid added render'd theſe Salts leſs antiſeptic; *viz.* the *Spiritus Mindereri* by a Half, and the ſaline Mixture by a third Part: Which was a Circumſtance very unexpected.

3. Next I proceeded to try Reſins and Gums, and began with Myrrh. As Part of this Subſtance diſſolves in Water, eight Grains were made into an Emulſion; but moſt of it ſubſiding, I could not reckon on a Solution of more than one or two Grains; which nevertheleſs preſerving the Fleſh longer than the Standard, we may account the ſoluble Part

---

Salt not acid. One Grain of Alum was weaker than 60 Grains of Sea-Salt; but two Grains were ſtronger. The Power therefore of Alum lies between 30 and 60; but, as I could judge by the Experiment, nearer the firſt Number.

Part of Myrrh perhaps about 30 times ſtronger than Sea-Salt.

Aloes, *Aſa fetida*, and the *Terra Japonica*, diſſolved in the ſame manner as Myrrh, like it ſubſided, and with the ſame antiſeptic Force. But Gum ammoniac and *Sagapenum* ſhewed little of this Virtue. Whether it was that they oppoſed Putrefaction leſs, or that all the antiſeptic Principle fell with the groſſer Parts to the Bottom. Three Grains of Opium diſſolved in Water did not ſubſide, and reſiſted Putrefaction better than the Salt. But I obſerved that more Air than uſual was generated, and the Fleſh became tenderer than with any of the ſtronger Antiſeptics.

Of all the reſinous Subſtances Camphire reſiſted moſt: Two Grains diſſolved in one Drop of Spirit of Wine, five Grains of Sugar, and two Ounces of Water exceeded the Standard: Tho', during the Infuſion, moſt of the Camphire flew off, ſwam a-top, or ſtuck to the Phial. Suppoſe only the Half loſt, the Remainder is at leaſt 60 times ſtronger than Salt; but if, as I imagine, the Water ſuſpended not above a tenth Part, then Camphire will be 300 times more antiſeptic than Sea-Salt. That nothing might be aſcribed to the minute Portion of the Spirit, uſed in this Experiment, I made another Solution of Camphire in a Drop or two of Oil, and found this Mixture leſs perfect, but ſtill beyond the Standard.

4. I made ſtrong Infuſions of Camomile-flowers, and of *Virginian* Snake-root; and finding them both greatly beyond the Standard, I gradually leſſened the Quantity of theſe Materials, till I found five Grains of either impart a Virtue to Water ſuperior

to

to 60 Grains of Salt. Now as we cannot ſuppoſe theſe weak Infuſions contained half a Grain of the embalming Part of theſe Vegetables, it follows, that this muſt be at leaſt 120 times more antiſeptic than common Salt.

I alſo made a ſtrong Decoction of the Bark, and infuſed a Piece of Fleſh in two Ounces of it ſtrained; which Fleſh never corrupted, tho' it remained two or three Days in the Furnace, after the Standard was putrid. In this time the Decoction became gradually limpid, whilſt the groſſer Parts ſubſided: By which it appears, that a moſt minute Portion of the Bark intimately mixed with Water (perhaps leſs than of the Snake-root, or Camomile-flowers) is poſſeſſed of a very extraordinary antiſeptic Force.

Beſides theſe, Pepper, Ginger, Saffron, Contrayerva-root, and Galls, in the Quantity of 5 Grains each, as alſo 10 Grains of dried Sage, of Rhubarb, and the Root of wild Valerian *, ſeparately infuſed, exceeded 60 Grains of Salt. Mint, Angelica, Ground-ivy, Senna, Green Tea, red Roſes, common Wormwood, Muſtard, and Horſe-radiſh, were likewiſe infuſed, but in larger Quantities, and proved more antiſeptic than the Standard. And as none of theſe can be ſuppoſed to yield in the Water above a Grain or two of the embalming Principle, we may look upon them all as very powerful Reſiſters of Putrefaction. Farther, I made a Trial with a Decoction of

* Tho' the Experiment was only made with ten Grains of the Powder of this Root, yet, conſidering how long that Quantity reſiſted Putrefaction, we may reckon the Valerian among the ſtrongeſt Antiſeptics.

of white Poppy-heads, and another with the expreſſed Juice of Lettuce, and found them both above the Standard.

By theſe Specimens we may now ſee how extenſive Antiſeptics are; ſince, beſides Salts, fermented Spirits, Spices and Acids, commonly known to have this Property, many Reſins, Aſtringents, and Refrigerants, are of the Number; and even thoſe Plants called Anti-acids, and ſuppoſed Haſteners of Putrefaction; of which Claſs Horſe-radiſh is particularly antiſeptic. And indeed after theſe Trials, I expected to find all diſſolvable Subſtances endowed with ſome Degree of this Quality; till, upon further Experiments, I perceived ſome made no Reſiſtance, and others promoted Corruption. But before I enter upon that Part of my Subject, it will be proper to relate ſome other Experiments more nearly connected with the preceding.

5. Having ſeen how much more antiſeptic theſe Infuſions were than Sea-Salt, I then tried whether Plants would part with this Virtue without Infuſion. For this Purpoſe, having three ſmall and thin Slices of the Lean of Beef, I rubbed one with the Powder of the Bark, another with Snake-root, and a third with Camomile-flowers. It was in the Heat of Summer, yet, after keeping theſe Pieces for ſeveral Days, I found the Fleſh with the Bark but little tainted, and the other two quite ſweet. The Subſtance of all the three was firm; particularly that with the Camomile, which was ſo hard and dry, that it ſeemed incorruptible. Why the Bark had not altogether the ſame Effect, was probably owing to its cloſe Texture.

6. I have alſo made ſome Attempts towards the ſweetening of corrupted Fleſh, by means of mild Subſtances; becauſe diſtill'd Spirits, or ſtrong Acids, the only things known to anſwer this Intention, were of too acrid and irritating a Nature to be thoroughly uſeful, when this Correction was moſt wanted, As for Salts, beſides their Acrimony, it is well known, that Meat once tainted will not take Salt.

A Piece of Fleſh weighing two Drachms, which in a former Experiment had become putrid, and was therefore very tender, ſpongy, and ſpecifically lighter than Water, was thrown into a few Ounces of the Infuſion of Camomile-flowers, after expreſſing the Air, to make it ſink in the Fluid: The Infuſion was renewed twice or thrice in as many Days; when, perceiving the *Fætor* gone, I put the Fleſh into a clean Bottle, with a freſh Infuſion; and this I kept all the Summer, and have it ſtill by me, quite ſweet, and of a firm Texture *. In like manner I have been able to ſweeten ſeveral ſmall Pieces of putrid Fleſh, by repeated Affuſions of a ſtrong Decoction of the Bark; and I conſtantly obſerved, that not only the corrupted Smell was removed, but a Firmneſs reſtored to the Fibres.

Now, ſince the Bark parted with ſo much of its Virtue in Water, it was natural to think it would ſtill yield more in the Body, when open'd by the *Saliva* and Bile; and therefore it was by this antiſeptic

* This Piece has been kept a Twelvemonth in the ſame Liquor, and is ſtill firm and uncorrupted.

ſeptic Virtue it chiefly operated. From this Principle we might account for its Succeſs in Gangrenes, and in the low State of malignant Fevers, when the Humours are ſo evidently putrid. And for Intermittents, in which the Bark is moſt ſpecific, were we to judge of their Nature, from Circumſtances attending them in Climates and Seaſons moſt liable to the Diſtemper, we ſhould aſſign Putrefaction as a principal Cauſe. They are the great Endemic of all marſhy Countries, and rage moſt after hot Summers, with a cloſe and moiſt State of Air. They begin at the End of Summer, and continue thro' Autumn; being at the worſt, when the Atmoſphere is moſt loaded with the *Effluvia* of ſtagnating Water, render'd more putrid by Vegetables and animal Subſtances that rot in it. At ſuch times all Meats are quickly tainted; and Dyſenteries, with other putrid Diſtempers, coincide with theſe Fevers. The Heats diſpoſe the Humours to Acrimony; the putrid *Effluvia* are a Ferment; and the Fogs and Dews, ſo common to thoſe Climates, ſtop Perſpiration, and bring on a Fever. The more theſe Cauſes prevail, the eaſier it is to trace this Putrefaction of Humours. The *Nauſea*, Thirſt, bitter Taſte of the Mouth, and frequent Evacuations of putrid Bile, are common Symptoms and Arguments for what is advanced. We ſhall add, that in moiſt Countries, in bad Seaſons, the Intermittents not only begin with Symptoms of a putrid Fever, but, if unduly managed, eaſily change into a putrid and malignant Form, with livid Spots and Blotches, and Mortification of the Bowels. But, as a thorough Diſcuſſion of this Queſtion might carry us too far from our preſent

Subject, and be unſeaſonable here, I ſhall refer it to its proper Place, and only remark, that whatever Medicines (beſides Evacuations and the Bark) have been found uſeful in the Cure of Intermittents, they are, ſo far as I know, all highly antiſeptic; ſuch are, Myrrh, Camphire, Camomile-flowers, Wormwood, Tincture of Roſes, Alum with Nutmeg, vitriolic or ſtrong vegetable Acids with Aromatics.

Thus far I have only related my Experiments upon Fleſh, or the fibrous Parts of Animals; I ſhould next proceed to ſhew, what Effects Antiſeptics have upon the Humours; for, tho' from Analogy we may conclude, that whatever retards the Corruption of the Solids, or recovers them after they are tainted, will act ſimilarly upon the Fluids; yet, as this does not certainly follow, I judged it neceſſary to make new Trials; which, with ſome Experiments on the Promoters of Putrefaction, the reverſe of the former, ſhall be offer'd to the *Society* at another Meeting.

N. B. *Theſe Experiments are continued in this Tranſaction, p.* 550.

III. *A Letter from Mr.* Joſeph Platt *to Mr.* Peter Collinſon *F. R. S. concerning a flat* Spheroidal Stone *having Lines regularly croſſing it.*

Dear Sir, *Mancheſter, Dec.* 9, 1749.

Read Nov. 8. 1750. A LITTLE while ſince a Man brought me a Stone, which he found at *Ardwick*, 7 Feet deep, near this Town, in driving a Slough through ſome Gret-ſtone. It is what I call

a

a Nodule, of a close, compact, smooth Matter; was incrustated with coarser Earth, or soft Stone; is 3 Inches and a half Diameter; form'd not unlike one of the *Echini marini*; except the *Papillæ* or small Protuberances, which it wants. Upon examining it, I find four white Seams, about the Bigness of a Horse-hair, which quarter the Stone very correctly. The Angles are exactly the same, and correspond so well, that it would require the nicest mathematical Head and Hand to draw the like. See TAB. I. *Fig.* 1.

The Diameter *AB* is 3.7 Inches; the strait Line *CD* at the Bottom, or greater Base, is .42 of an Inch; that at the Top of the Stone is .21 of an Inch, which make the Angles *CD* equal at Top and Bottom, tho' of different Diameters. The Seams are like Talc or Spar. It weighs about 3 Pounds. I have several Nodules, but none like this. There is nothing curious in this Stone but the Lines, which I have described in the best manner I can. I am confident Chance had no Hand in forming it; and I am as certain, that no Artist was ever concerned or able to do the like; therefore I conclude it has been something form'd before the Flood, and is of marine Production. I am

Your much obliged Friend,
and humble Servant,
Joseph Platt.

The Stone having been since cut in two, it was found that those regular Lines, composed of a sparry Matter, penetrated the whole Substance of the Stone quite thro', and that they grew wider as they were nearer to the Centre. I have given a Representation of this Section at *Fig.* 2. TAB. I.

C. M.

IV. *A Letter from* Arthur Dobbs *Esq*; *to* Charles Stanhope *Esq*; *F. R. S. concerning* Bees, *and their Method of gathering* Wax *and* Honey.

SIR, *Castle-Dobbs, Oct.* 22, 1750.

Read Nov. 8. 1750. SINCE my View of doing Good, by making Discoveries of the Great World has been disappointed, upon my Retirement into this little Corner of it, [*Ireland*] amongst other rural Amusements I have been contemplating the Inhabitants of the Little World; particularly that most useful and industrious Society of Bees; and have had Time to revise the curious, ingenious, and entertaining Account given by M. *Reaumur*, of that inimitable Insect, with his curious Remarks and Reasoning about them; since he has been indefatigable in his Experiments and Observations about them, as well as of most other Insects, I think it the Duty of every Person, who has had Time to make any Observations, which may contribute to come at the Truth, and complete his Natural History of Insects, to throw in his Mite towards it.

I had Leisure and Opportunities many Years ago, to make some Observations about Bees; and all that I made confirm his general Theory, as well from his microscopical Observations, as those made by means of glass Hives; in which he had much greater and better Opportunities to make Observations than I have had: However, as there are two Things, in which my Observations are different from his, I think

think it but Juſtice to the curious and learned World to mention them; that M. *Reaumur*, in caſe he be alive, and ſtill able to follow his Obſervations, or, if he is not, that ſome other curious Perſon may make future Remarks, to know whether thoſe I have made are true: As I muſt own myſelf diffident of my own Obſervations, when they differ from ſo accurate, minute, and careful an Obſerver, as he has ſhewn himſelf to be throughout his whole Theory of Inſects in general, and more particularly of the Society of our Garden-Bee.

I therefore beg Leave to lay the few Remarks I have made before you, Sir; that if you think there is any thing in them worth communicating, you may lay them before the *Royal Society*, of which you are a worthy Member; or communicate them to M. *Reaumur*, if he be ſtill alive, and follows his Obſervations; that, in caſe my Obſervations are found true, he may ſo far alter his Remarks; and if they are not confirm'd, I ſhall willingly ſubmit to his future Obſervations.

The only two things in which I differ from M. *Reaumur*, are, that I apprehend he ſays, the Bees range from Flowers of one Species to thoſe of another Species, whilſt they are gathering one Load; ſo that the *Farina*, or crude Wax, loaded upon their Legs, is from different Species of Flowers; which is contrary to what I have obſerved. The other thing that I differ with him in is, that he ſays the Wax is formed in the Bee, from the crude Wax, or *Farina* (ſo far I agree with him): But by his Obſervations, he ſays, after Digeſtion it is diſcharged upwards by the Mouth; whereas, by my Obſervations,

is

it is the *Fæces*, Husks, or Shells of the *Farina* or crude Wax, after Digeſtion, diſcharg'd by the *Anus*.

As to the firſt, I have frequently follow'd a Bee loading the *Farina*, Bee-Bread, or crude Wax, upon its Legs, through a Part of a great Field in Flower; and upon whatſoever Flower I ſaw it firſt alight and gather the *Farina*, it continued gathering from that kind of Flower; and has paſs'd over many other Species of Flowers, tho' very numerous in the Field, without alighting upon or loading from them; tho' the Flower it choſe was much ſcarcer in the Field than the others: So that if it began to load from a Daiſy, it continued loading from them, neglecting Clover, Honeyſuckles, Violets, *&c.*; and if it began with any of the others, it continued loading from the ſame Kind, paſſing over the Daiſy. So in a Garden upon my Wall-Trees, I have ſeen it load from a Peach, and paſs over Apricots, Plums, Cherries, *&c.* yet made no Diſtinction betwixt a Peach and an Almond.

Now M. *Reaumur*, in his Memoir upon the Bee's making Honey, mentions *Ariſtotle*'s Obſervation of the Bee's loading or gathering from one Species of Flower without changing; not quitting a Violet to gather from a Cowſlip; which he ſays is not juſtly founded; for he has obſerved frequently a Bee on a large Border gathering from Flowers of different Species. If M. *Reaumur* only means, that, when the Bee gathers Honey, it takes it indifferently from any Flower, I can ſay nothing againſt it; but, if he intends it to mean the Bee's loading the *Farina* upon its Legs, then my Obſervation directly contradicts it.

What

What further confirms my Obſervation is this, that each Load upon the Legs of a Bee is of one uniform Colour throughout, as a light Red, an Orange, a Yellow, a White, or a Green, and is not upon different Parts of the Load of a different Colour; ſo that as the *Farina* of each Species of Flowers, when collected together, is of one uniform Colour, the Preſumption is, that it is gather'd from one Species. For, if from different Kinds, Part of the Load might be of one Colour, and Part of another.

Another Obſervation to confirm the ſame Fact is, that Bees, in the Height of the Seaſon, return to their Hives with Loads of very different Magnitudes, ſome having Loads as great as ſmall Shot, whilſt others have very ſmall Loads; it cannot be conceiv'd that this Difference is from the Inactivity or Sloth of the Bee in collecting its Load, but rather from the Scarcity of the Flowers, upon which it firſt began to load.

Now, if the Facts are ſo, and my Obſervations true, I think that Providence has appointed the Bee to be very inſtrumental in promoting the Increaſe of Vegetables; but otherwiſe, might be very detrimental to their Propagation; and at the ſame time they contribute to the Health and Life of their own Species.

From the late Improvement made by Glaſſes, and Experiments made, in obſerving the Works of Nature, it is almoſt demonſtrable, that the *Farina* upon the *Apices* of Flowers is the Male Seed; which entering the *Piſtillum* or *Matrix* in the Flower, impregnates the *Ovum*, and makes it prolific. It is often neceſſary to have Wind and dry Weather to

waſt this *Farina* to the *Piſtillum*, and from Flower to Flower, to make the Seed prolific: And we find in wet Seaſons, that Grain, Nuts, and Fruit, are leſs prolific, by the *Farina*'s not being properly convey'd to the *Piſtillum*; and alſo in very hot dry Weather, from clammy Honey-Dews, or, more properly ſweet Exſudations from the Plants themſelves, which clogs the *Farina*, and cauſes Blaſts and Mildews. Now, if the *Farina* of ſpecifically different Flowers ſhould take the Place of its own proper *Farina* in the *Piſtillum*, like an unnatural Coition in the animal World, either no Generation would happen, or a monſtrous one, or an Individual not capable of further Generation.

Now if the Bee is appointed by Providence to go only, at each Loading, to Flowers of the ſame Species, as the abundant *Farina* often covers the whole Bee, as well as what it loads upon its Legs, it carries the *Farina* from Flower to Flower, and by its walking upon the *Piſtillum* and Agitation of its Wings, it contributes greatly to the *Farina*'s entering into the *Piſtillum*, and at the ſame time prevents the heterogeneous Mixture of the *Farina* of different Flowers with it; which, if it ſtray'd from Flower to Flower at random, it would carry to Flowers of a different Species.

Beſides theſe viſible Advantages, it may be of great Benefit to their own Species and Society; for, as this *Farina* is the natural and conſtant Food of the Bees, during one Half of the Year, and from this digeſted, as it is accurately obſerved by M. *Reaumur*, is the *Bouillée* and Jelly formed; which is lodg'd for the Food of the young Bees, until they become *Nymphæ*:

Nymphæ: It is alſo neceſſary that Stores of it ſhould be lodg'd in the Cells adjoining to the Honey, for their Winter Proviſion; without which Mr. *Reaumur* obſerves they would be in Danger of dying of a Looſeneſs, their moſt dangerous Malady.

It ſeems therefore highly reaſonable to believe, that different Kinds of *Farina* may have different phyſical Qualities: So that, by making Collections of the ſame kind in each Cell, they may have proper Remedies for themſelves againſt Ailments we have no Knowlege of, which otherwiſe they would not have, if they were filled at random from all Kinds of Flowers. Theſe further Advantages, directed to them by Providence, ſeem to add Weight to my Obſervations, and are a preſumptive Proof that they are true.

The only thing, beſides the former, wherein myObſervations differ from Mr. *Reaumur*, is in the Manner the Wax is made and emitted by the Bee. I abſolutely concur with him, that the Wax is formed by Digeſtion in the Bodies of the Bees, and is emitted by them, and then becomes Wax; and that it is almoſt impracticable to form Wax any other Way, unleſs the Wax extracted from the Myrtle-berries in *America* by boiling be an Exception from it.

By M. *Reaumur*'s Obſervations, he forms his Opinion, that after the Bee has fed upon the *Farina*, or Bee-Bread, and it has paſs'd through the firſt Stomach (which is the Reſervoir where the Honey is lodg'd, from whence it is diſcharg'd upwards by its Mouth into the Cells) it is convey'd into the ſecond Stomach; and yet, when there, great Part of it continues in its ſpherical or oval Form, ſtill undigeſted,

as view'd by him with his Glaſſes; and conſequently muſt be convey'd further, before it be thoroughly digeſted, and the Particles broke; yet this he ſuppoſes is reconvey'd upwards through both the Stomachs, and is emitted by its Mouth; and forms his Judgment from his Obſervation, that the Bee, when working, and finiſhing the Cells, nips with its Teeth the Wax, where it is too thick, or wrong laid; and has obſerved a Motion of its Tongue as it were ſmoothing or laying on more Materials, which he thinks muſt be then diſcharg'd from the Stomach by its Mouth.

What makes me diſagree with him in his Opinion and Obſervations, is from the Remarks I have made, that the *Fæces* of the Bee diſcharg'd by the *Anus*, after the *Farina* is digeſted, is the true Wax. We may with Truth believe, that the *Farina*, which is the male Seed of all Vegetables, conſiſts of a Spirit or moving Principle, floating in a ſweet Oil, ſurrounded by an exterior Coat or Shell, in which is that *Monade* that impregnates the Grain or Fruit, and makes it prolific; that, upon Separation or Digeſtion, this Spirit and Sweet Oil becomes the Nouriſhment of the Bee; which Spirit is of the ſame Nature with the Animalcules *in ſemine maſculino* of Animals, and becomes the animal Spirits in the Bee and other Animals; and perhaps the true Honey is the ſweet Oil included in the *Farina:* And as all Vegetables abound with theſe vegetable vivifying Atoms, ſince, from many, every Bud is capable of increaſing each Species, ſo the true Honey breaking through its Shell by great Heat, occaſions thoſe Honey-Dews obſerv'd in hot Weather upon the Leaves and

Flowers

Flowers of moſt Vegetables; which is no more than an Exſudation from the Leaves and Bloſſoms of theſe Veſſels that break with the Heat; beſides thoſe that appear on the *Apices* of Flowers, which afterwards impregnates the Fruit.

Of this inward Subſtance of the *Farina*, diluted with Water, after Digeſtion, is formed the *Bouillée* and Jelly, which the Bees diſcharge upwards by the Mouth, into the Cells, to nouriſh the young Bees until they become *Nymphæ*; whilſt the Huſk or outer Coat is diſcharg'd by the *Anus*, and becomes the genuine Wax.

I have frequently, when Bees have been ſwarming, had them alight upon my Hands and Cloaths; and many, at different times, have diſcharged their *Fæces* thereupon: This I have taken off, and found it of the Conſiſtence of warm Wax, with the ſame glutinous adhering Quality, not crumbling like the *Farina*. I have alſo diſtinguiſh'd it by the Smell to be Wax; but it had a heavier ſtronger Smell, as it was freſh and warm from the Bee.

What further confirmed me in this Fact, was from my Obſervation of the Bees when working up their Comb in a glaſs Hive; where I have conſtantly ſeen (and muſt believe it impoſſible not to be obſerved by ſo accurate an Obſerver as M. *Reaumur*) that ſeveral Bees, ſoon after one another, have by haſty Steps, walk'd along a Comb then forming, for the Length of two or three Cells, bending their Tails to the Comb, and ſtriking it with a wriggling Motion from Side to Side, in a zigzag Way; which I was convinced was diſcharging their *Fæces*, or the Wax, againſt the Border of the Cells, as they

they ran along, and repeated it as long as they had any to diſcharge, and then quit it; which is the Reaſon why the outward Border of the Cells is ſo thick and ſtrong: And immediately afterwards, other Bees came along the Cells, and with their fore Feet rais'd up the Borders like Paſte, and thinning it, whilſt other Bees were ripping off with their Teeth, and pruning away any irregular Excreſcences, ſo as to make the Diviſions of the Cells vaſtly thinner than the Borders or Edges, which were always thick and ſtrong, from the diſcharging the *Fæces* or Wax upon them.

M. *Reaumur* has very juſtly obſerved, that, beſides the three tranſparent ſmooth Eyes, which the Bee has placed in a Triangle betwixt the *Antennæ* on the Top of its Head, the Bee has alſo on each Side of its Head an Eye, or rather a Multitude of Eyes, form'd by a Number of diſtinct *Lens's* ſurrounded each with ſhort Hairs, which are confirm'd to be Eyes, both from *Swammerdam*, and his own Experiments to determine it; and that, notwithſtanding theſe *Lens's* are lin'd with a dark opaque Subſtance, yet they aſſiſt ſo much their Viſion, that, when darkened by Paint laid over them, the Bees could not find their Way to their Hive, tho' at a ſmall Diſtance, but ſoar'd directly upwards; nor could they find their Way when the three ſmooth Eyes were darkened.

But there is one Obſervation, which I don't find he has made, which may have determined the Garden Bees to make almoſt all their Cells imperfect Hexagons. The Obſervation is this; that theſe opaque Eyes on each Side of the Head, conſiſt of many *Lens's*, each of which is a perfect Hexagon; and the whole

whole Eye, when view'd in a Microſcope, appears exactly like a Honeycomb: Now, as the Eyes compos'd of theſe hexagonal *Lens's*, are in full View to the other Bees, does it not ſeem that Providence has directed them ſo as to be a Pattern ſet before them, for the Bees to follow in forming their Combs? Is it not alſo reaſonable to believe, from the Diſproportion of the Convexity betwixt the three ſmooth tranſparent Eyes, and the *Lens's* of the dark rough Eyes, that they are appointed for different Purpoſes? why may it not be thought that the *Lens's* are great Magnifiers, to view things nigh at hand, and by many Reflexions to convey Light into the dark Hives, where Light is ſtill neceſſary; and that the three other Eyes are to obſerve Objects at a great Diſtance, ſo as to conduct them abroad to Fields at a Diſtance, and back again to their Hives?

I agree with M. *Reaumur* in the Form and Uſe of the Fang or Tromp of the working Bee, and of the Uſe of the Mouth within the Teeth of the Bee; ſo that it does not ſuck, but laps or licks with its rough Fang or Tromp, like a Dog. But I have never obſerved the Bee nipping or breaking open the *Apices* of Flowers, to let out the *Farina*, when it is not fully blown or open; but have often with Pleaſure obſerved the Bee gathering the *Farina* upon its Fang, by licking it off the *Apices*, and laying it upon the firſt Pair of Legs, which convey it to the ſecond Pair, and theſe lodge it upon the Pallet of the third Pair, with ſurpriſing Briskneſs; ſo that, by the time the ſecond Pair has lodg'd it upon the third Pair, the Bee has gather'd more, and lodg'd it on the fore Legs; ſo that all are in conſtant Motion.

From

From the curious Obſervations made by M. *Reaumur*, upon the Structure and Behaviour of the Queen or Mother-Bee, the Drone or Male Bee, and the working or Mule Bee, which is of neither Sex; from the Queen Bee's being ſo exceedingly prolific, as to lay from 30 to 40000 Eggs of working Bees in a Seaſon; beſides the Eggs of 800 Male Bees, and of eight or ten Queen or Mother Bees; and from the Coldneſs of the Male Bee, who ſo long reſiſts the Careſſes of the Queen or Female Bee; and alſo from the indefatigable Labour and Oeconomy of the working Bee, to nouriſh the young Bees, make up the Combs, and lay in Stores of *Farina* and Honey for Winter. I think very good Reaſons may be given why the Queen ſhould have a Seraglio of ſome Hundreds of Male Bees; and why the working Bee ſhould deſtroy the Males, when no longer neceſſary to impregnate the Eggs of the Mother Bee.

It is evident, from the Oeconomy of the Garden Bee, that Providence has appointed that they ſhould ſhare their Store with Mankind, by making them ſo induſtrious in every Climate, as to provide, in tolerable Seaſons, a Store of Honey and Wax, double of what is neceſſary for their Subſiſtence during the Winter, and of Combs for the Queen's laying her Eggs in Spring, before new Work can be made. From the vaſt Number of Eggs which the Queen lays in a Seaſon, it is abſolutely neceſſary that ſhe ſhould have a great Store of Male Sperm, to impregnate her Eggs; and as the Eggs are not ſenſibly large in her Body for 6 Months after her Coition with the Males, who die, or are killed, in *Auguſt*, and ſhe does not begin to lay from that time till

February

February or *March*; it is therefore neceſſary that ſhe ſhould have a great Store of Male Sperm within her, to impregnate all the Eggs ſhe lays from that time, until *June* or *July*, when young Drones or Males are hatch'd, who are not deſigned for her Uſe, but for the young Queens, who go off with the Swarms, or for the young Queen who ſucceeds the old one in the old Hive; ſince the Drones are great Feeders, and no Workers; and are of no Uſe, but to give a ſufficient Store of Sperm to the Mother-Bee; as the working Bees have ſo many Enemies to deprive them of their Store, they can't be maintain'd during the Winter, even if their Life ſhould laſt ſo long; and as it is probable each Male has but one Act of Coition with the Queen, as they are ſo cold, and take ſo much careſſing before they act, and, by M. *Reaumur*'s Obſervation, die ſoon after the Act is over, when, probably, their whole Store of Sperm is exhauſted in that Act, as ſoon as the Queen has got as much Sperm lodg'd in the proper Reſervoir, as is ſufficient to impregnate all her future Eggs, the Males are no longer of Uſe; and if thoſe who have acted, die, thoſe who have not, being of no further Uſe, are killed by the working Bee, out of Oeconomy to ſave their Winter Store, when, probably, by Nature they could live but few Days more; as we find the Silk-worm Moth dies ſoon after the Eggs are laid, as well Males as Females. It ſeems therefore neceſſary that the Queen ſhould breed ſo many Males, as, by one Act of Coition from each, may impregnate all her Eggs, and that the working Bee ſhould diſpatch them, as ſoon as that is over, and a Store is lodg'd.

There are two Veſſels deſcrib'd by *Swammerdam* in the Mother-Bee, whoſe Plate M. *Reaumur* has given in his Memoirs; one of which is placed betwixt the two Lobes of the *Ovarium*, which he ſuppoſes to be a Bladder to contain Air; the other is a ſpherical Veſſel, ſeated cloſe by the common Duct, in which the Eggs fall from the Lobes of the *Ovarium*, which he ſuppoſes is to ooze out a Juice to moiſten the Eggs in their Paſſage. I take one of theſe, but moſt probably the laſt, to be the Reſervoir and Repoſitory of the Male Sperm, wherein it is lodg'd from the Act of Coition, until the Eggs are inlarg'd, and paſs thro' the adjoining Duct from the two Lobes of the *Ovarium*.

Since the Preſervation and Increaſe of Bees are evidently beneficial to the Public, I approve very much of M. *Reaumur*'s Inſtructions in driving Bees from a full Hive into an empty one, in caſe it can be done time enough to have new Work, ſufficient for the Queen to lay her Eggs in in Spring; ſince they can be fed at very little Expence, if Care be taken to keep them in a middle State of Stupefaction, neither too hot nor cold, during the Winter: But I approve much more of his caſtrating or ſharing the Combs with the Bees, by taking the Combs beſt ſtor'd with Honey, and leaving thoſe wherein are the *Nymphæ* and Bee-bread; but think in taking the Combs a ſafer and eaſier Way may be taken, than he directs: His Method is to ſtupefy the Bees with Smoke, to oblige them to croud together in the Crown of the Hive, and then turning up the Hive, and cutting out the Combs fill'd with Honey. Now I think, that turning up the full Hive, and ſetting an empty Hive upon it,

it, and driving the Bees into it, is preferable to ſmoking: For then a very few Bees will remain in the full Hive; and thoſe few may be ſtupefied, and the Bees in the empty Hive being put on a Table, the Combs may be taken out and ſelected at leiſure, without Hazard; and afterwards the empty Hive may be turn'd up, and their old Hive ſet over them, ſo that they will go up without Scruple into their former Hive, and repair their Work, by making new Combs: And if the Queen had not quitted the old Hive, as is often the Caſe, then they would return to their Queen, and the Society would not be loſt, as is ſometimes the Caſe, in driving into an empty Hive.

Theſe, Sir, are the few Remarks I have made on reviſing M. *Reaumur*'s curious Obſervations on Bees, which I thought incumbent upon me to ſend you, to lay before your Learned *Society*, if it may contribute towards finiſhing the Natural Hiſtory of Bees. I ſhall take up no more of your Time, than to aſſure you, that I am, with the greateſt Regard,

SIR,

Your moſt obedient, and moſt humble Servant,

Arthur Dobbs.

V. *Further Experiments on Subſtances reſiſting* Putrefaction; *with Experiments upon the Means of haſtening and promoting it*; *by* John Pringle *M. D. F. R. S.*

Read Nov. 15, 1750. HAVING given a particular Account of the Manner of trying Antiſeptics on the fibrous Parts of Animals *, I ſhall only mention the Reſult of ſome Experiments made with them upon the Humours.

1. Decoctions of Wormwood and of the Bark, alſo Infuſions of Chamomile-flowers, and of Snake-root preſerved Yolks of Eggs, not only ſeveral Days longer than Water did alone, but alſo when a good Quantity of Sea-Salt was added to it. I likewiſe found that Salt of Hartſhorn preſerved this Subſtance better than four times its Weight of Sea-Salt.

2. Ox's Gall was kept ſome time from Putrefaction by ſmall Quantities of Lye of Tartar, Spirit of Hartſhorn, crude *Sal Ammoniac*, and the ſaline Mixture, and ſtill longer by a Decoction of Wormwood, Infuſions of Camomile-flowers, and of Snake-root; by Solutions of Myrrh, Camphire, and Salt of Amber: All were ſeparately mixed with Gall, and found more antiſeptic than Sea-Salt; and ſeemingly in proportion to their Effects upon Fleſh. Only Nitre failed; which, tho' four times ſtronger than Sea-Salt in keeping Fleſh ſweet, is inferior to it in preſerving Gall; and remarkably weaker than crude *Sal Ammoniac*; which again is ſomewhat leſs powerful than

* See this *Tranſaction*, *p.* 525, &c.

than Nitre in preſerving Fleſh. The Nitre was ſoon opened by the Gall, and emitted a vaſt Quantity of Air, which roſe as from a fermenting Liquor; and when this happened, the Gall began to putrefy. But the ſaline Mixture generated no Air, and oppoſed the Putrefaction of Gall more than it did that of Fleſh.

3. The laſt Trial was with the *Serum* of human Blood, which was preſerved by a Decoction of the Bark, and an Infuſion of Snake-root, nor with leſs Efficacy than Fleſh. But Saffron and Camphire were not here above a fourth Part ſo antiſeptic as before; whether it be that they are leſs preſervative of this Humour, or, as I ſuſpect, that they were not well mixed. Nitre acted nearly with its full Force, being about four times ſtronger than Sea-Salt: It generated ſome Air, but much leſs than it did with the Gall. No other Humour was tried; but, from theſe Specimens added to the former Experiments, we may conclude, that whatever is preſervative of Fleſh will be generally antiſeptic, tho' perhaps not always with equal Force.

4. Having already ſhewn how putrid Fleſh might be ſweetened, I ſhall conclude this Part of my Subject with a like Trial upon the Yolk of an Egg. A Portion of this, being diluted with Water, ſtood till it corrupted; when a few Drops were put into a Phial with two Ounces of pure Water, and about twice as many Drops were mixed with a ſtrong Infuſion of Camomile-flowers. At firſt both Phials had ſome Degree of a putrid Smell; but being corked, and kept a few Days near a Fire, the Mixture with

plain

plain Water contracted a ſtrong *Fœtor*, whilſt the other ſmelled only of the Flowers.

Thus far have I related the Experiments made of Antiſeptics; by which it appears, that, beſides Spirits, Acids, and Salts, we are poſſeſſed of many powerful Reſiſters of Putrefaction, endued with Qualities of heating, cooling, Volatility, Aſtriction, and the like, which make ſome more adapted than others to particular Indications. In ſome putrid Caſes, many proper Antiſeptics are already known; in others they are wanting. We are yet at a Loſs how to correct the *Sanies* of a cancerous Ulcer; but, from ſuch a Multitude of Antiſeptics, it is to be hoped ſome may be found at laſt adequate to that Intention. It may be farther remarked, that, as different Diſtempers of the putrid kind require different Antiſeptics, ſo the ſame Diſeaſe will not always yield to the ſame Medicine. Thus the Bark will fail in a Gangrene, if the Veſſels are too full, or the Blood ſizy: But, if the Veſſels are relaxed, and the Blood reſolved or diſpoſed to Putrefaction, either from a bad Habit, or the Abſorption of putrid Matter, then is the Bark a good Specific. With the ſame Caution are we to uſe it in Wounds; *viz.* chiefly in Caſes of abſorbed Matter, which infects the Humours, and induces a hectic Fever. But, when inflammatory Symptoms prevail, the ſame Medicine increaſing the Tenſion of the Fibres, and Sizineſs of the Blood, a State directly oppoſed to the other, has ſuch Conſequences as might be expected.

By the Succeſs of the Bark in ſo many putrid Caſes, it ſhould appear that Aſtriction had no ſmall Share in the Cure. And indeed the very Nature of Putrefaction

Putrefaction conſiſts in a Separation or Diſunion of the Parts. But as there are other Caſes, in which Aſtringency is leſs wanted, we may find in Contrayerva-root, Snake-root, Camphire, and other Subſtances, a highly antiſeptic Power, with little or none of the other Quality. And ſince ſeveral of theſe Medicines are alſo diaphoretic, their Operation is thereby render'd more ſucceſsful.

I come now to the laſt thing propoſed, which was, to give an Account of ſome Obſervations made on Subſtances haſtening or promoting Putrefaction; an Inquiry not leſs uſeful than the former. For, ſetting aſide the offenſive Idea commonly annexed to the Word, we muſt acknowledge Putrefaction to be one of the Inſtruments of Nature, by which many great and curious Changes are brought about. With regard to Medicine, we know, that neither animal nor vegetable Subſtances can become Aliment, without undergoing ſome Degree of Putrefaction. Many Diſtempers proceed from a Deficiency of this Action. The *Criſes* of Fevers ſeem to depend upon it; and perhaps even animal Heat, according to a late ingenious Theory *.

But, in the Proſecution of this Subject, I have met with very few real Septics; and found many Subſtances, commonly accounted ſuch, of a quite oppoſite Nature. The moſt general means of accelerating Putrefaction is, by Heat, Moiſture, and ſtagnating Air; which being ſufficiently known and aſcertained, I paſſed

* An Eſſay on the Cauſe of animal Heat, by *J. Stevenſon, M. D. Vide* Medical Eſſays, Vol. V.

paſſed over, without making any particular Experiment on thoſe Heads. Lord *Bacon* *, as well as ſome of the Chemiſts, has hinted at a putrid Fermentation, analogous to what is found in Vegetables; and this having ſo near a Connexion with Contagion, I made the following Experiment, for a further Illuſtration of this Matter.

5. In the Yolk of an Egg, already putrid, a ſmall Thread was dipped, and a ſmall Bit of this was cut off and put into a Phial, with Half of the Yolk of a new-laid Egg diluted with Water. The other Half, with as much Water, was put into another Phial, and both being corked, were ſet by the Fire to putrefy. The Reſult was, that the Thread infected the freſh Yolk; for the Putrefaction was ſooner perceived in the Phial that contained it, than in the other. But this Experiment was not repeated.

In this manner the Putrefaction of Meat advances quicker in a confined than a free Air; for, as the moſt putrid Parts are alſo the moſt fugitive; they inceſſantly iſſue from a corruptible Subſtance, and diſperſe with the Wind; but in a Stagnation of Air, they remain about the Body; and by way of Ferment excite it to Corruption.

6. As for other Septics, recited by Authors, I found none of them anſwer the Purpoſe. The alcaline Salts have been conſider'd as the chief Putrefiers. But this is diſproved by Experiments. Of the Volatiles it may be indeed obſerved, that, tho' they preſerve from the common Marks of Putrefaction, with

---

* Vide *Nat. Hiſt.* Cent. IV. Exper. 330.

with a Force four times greater than that of Sea Salt; yet, in warm Infuſions, a ſmall Quantity of theſe Salts will ſoften and reſolve the Fibres, more than Water does by itſelf. They alſo hinder the Coagulation of Blood; and when taken by way of Medicine, thin and reſolve it, but are not therefore Septics. For, ſo little do theſe Salts putrefy, or even reſolve the Fibres, when applied dry, that I have kept, ſince the Beginning of *June* laſt, notwithſtanding the exceſſive Heats, a ſmall Piece of Fleſh in a Phial, preſerved only with Salt of Hartſhorn, at preſent perfectly ſound, and firmer than when firſt ſalted.

7. From the Specimens we had of the antiſcorbutic Plants, it is likewiſe probable none of that Tribe will prove ſeptic. Horſe-radiſh, one of the moſt acrid, is a very powerful Antiſeptic. And tho' Carrots, Turneps, Garlick, Onions, Celery, Cabbage, and Colewort, were tried (as Alcaleſcents) they did not haſten, but ſomewhat retarded, the Putrefaction.

8. The Caſe was different with ſuch farinaceous Vegetables as were examined; *viz.* white Bread in Infuſion, Decoctions of Flour, Barley, and Oatmeal; for theſe did not at all retard Putrefaction; but, after it was ſomewhat advanced, they check'd it, by turning ſour. By a long Digeſtion the Acidity became conſiderable; which, by conquering the Putreſcency of the Fleſh, and generating much Air, did not ill repreſent the State of weak Bowels, which convert Bread, and the mildeſt Grains, to ſuch an Acid, as prevents a due Reſolution and Digeſtion of animal Food *.

9.

* It is to be remarked, that, in making this Experiment, I did not then attend to a Fermentation that enſued, and which was the Cauſe

9. I examined *Cantharides*, dried Vipers, and *Ruſſian Caſtor*, all animal Subſtances, and therefore moſt likely to prove ſeptic. The Flies were tried both with freſh Beef, and with the *Serum* of human Blood; the Vipers only with the former; but neither of them haſtened Putrefaction. And as for the *Caſtor*, ſo far from promoting this Proceſs, that an Infuſion of 12 Grains oppoſed it more than the ſtandard Salt.

10. After finding no Septics where they were moſt expected, I diſcovered ſome which ſeemed the leaſt likely; *viz.* Chalk, the *Teſtacea*, and common Salt.

Twenty Grains of Crabs-eyes prepared, were mixed with 6 Drachms of Ox's Gall, and as much Water; into another Phial was put nothing but Gall and Water, in the ſame Quantity with the former; and both being placed in the Furnace, the Putrefaction began much ſooner, where the Powder was, than in the other Phial. I infuſed afterwards in the Lamp-Furnace 30 Grains of prepared Chalk, with the uſual Quantity of Fleſh and Water; and obſerved, that the Corruption not only began ſooner, but went higher by this Mixture; nay, what had never happened before, that in a few Days the Fleſh reſolved into a perfect *Mucus*. The Experiment was repeated with the ſame Effect; which being ſo extraordinary, I ſuſpected ſome corroſive Subſtance had been mixed with the Powder: But, for a Trial, a Lump of

---

Cauſe of the Acidity. This kind of Fermentation between animal and vegetable Subſtances, being hitherto overlooked, ſhall be therefore ſet forth in my next Paper.

of Chalk being pounded, 30 Grains of it proved fully as ſeptic as the former. The ſame Powder was compared with an equal Quantity of Salt of Wormwood, and Care was taken to ſhake both the Mixtures alike: But, after three Days warm Digeſtion, the Salt had neither tainted nor ſoften'd the Fleſh, whilſt the Chalk had rotted and conſumed that which was joined to it. Nor were the Effects leſs of the teſtaceous Powders of the Diſpenſary. Egg-ſhells in Water reſiſted Putrefaction, and preſerved the Meat longer firm than plain Water *.

11. To try whether the *Teſtacea* would alſo diſſolve vegetable Subſtances, I infuſed them with Barley and Water, and compared this Mixture with another of Barley and Water, without the *Teſtacea*. After a long Maceration by a Fire, the plain Water ſwelled the Barley, became mucilaginous and ſour; but that with the Powder kept the Grain to its natural Size, tho' it ſoftened it, made no Mucilage, and remained ſweet.

12. Nothing could be more unexpected than to find Sea Salt a Haſtener of Putrefaction. But the Fact is thus. One Drachm of Salt preſerves two Drachms of freſh Beef, in two Ounces of Water, above 30 Hours, uncorrupted, in a Heat equal to that of the human Body; or, what amounts to the ſame, this Quantity of Salt keeps Fleſh about 20 Hours longer ſweet, than pure Water; but half a Drachm of Salt does not preſerve it above 2 Hours longer. This Experiment has been already mentioned.

* The Trial was made with a coarſe Powder, of this Subſtance, but not repeated.

tioned. Now I have ſince found, that 25 Grains have little or no antiſeptic Virtue; and that 10, or 15, or even 20 Grains manifeſtly both haſten and heighten the Corruption *. It is moreover to be remarked, that in warm Infuſions with theſe ſmaller Quantities, the Salt, inſtead of hardening the Fleſh, as it does in a dry Form, in Brine, or even in Solutions, ſuch as our Standard, it here ſoftens and relaxes the Texture of the Meat, more than plain Water; tho' much leſs than Water with Chalk, or the teſtaceous Powders.

Many Inferences might be made from this Experiment; but I ſhall only mention one. Salt, the indiſpenſable Seaſoner of animal Food, has been ſuppoſed to act by an antiſeptic Quality, correcting the too great Tendency of Meats to Putrefaction. But, ſince it is never taken in Aliment beyond the Proportion of the corrupting Quantities in our Experiment, it would appear that Salt is ſubſervient to Digeſtion, chiefly by a ſeptic Virtue; that is, by ſoftening and reſolving Meats; an Action very different from what is commonly believed.

---

* The moſt putrefying Qantity of Salt, with this Proportion of Salt and Water, is about 10 Grains.

VI.

VI. *A Letter from Mr.* John Robertſon *to the* Preſident, *containing an Explanation of the late Dr.* Halley's *Demonſtration of the Analogy of the* Logarithmic Tangents *to the* Meridian Line, *or Sum of the* Secants.

SIR,

Read Nov. 22. 1750. MY Curioſity having lately led me to peruſe ſeveral Books on the Art of Navigation, I was ſomewhat ſurpriſed not to find in any one of them a clear Explanation of that moſt curious Paper in N° 219. of the *Philoſophical Tranſactions*, written by the excellent Mathematician Dr. *Halley*; who, not intending to write for Beginners, as himſelf confeſſes, has drawn his Concluſions in a manner, that ſeems to ſtand in need of an Explanation, for the Generality of Readers: And as the maritime People are not the beſt acquainted with mathematical Knowledge, it might have been expected, that ſuch of the Writers on Navigation within the laſt 50 Years, who have undertaken to demonſtrate the ſeveral Parts of their Subject, would have removed the Difficulties in the Doctor's Paper, inſtead of leaving them in the ſame State in which they firſt appeared.

Dr. *Halley*, in this Tract, ſeems to have had two chief Points in View; Firſt, To prove, that *the Diviſions of the Meridian Line in a Mercator's Chart*,

Chart, were analogous to the logarithmic Tangents of the Half-Complements of the Latitudes. And, ſecondly, *To find a Rule by which the Tables of meridional Parts might be computed from* Briggs's, *or the common logarithmic Tangents.* The former of theſe the Doctor has clearly and elegantly proved: But he has given rather too few Steps to ſhew as clearly the Inveſtigation of the latter.

Indeed in many of the Treatiſes on Fluxions, it is ſhewn how to inveſtigate a Rule to find the meridional Parts to any Latitude: But, to underſtand thoſe Methods, requires ſome Skill in algebraical and fluxionary Computations; neither of which are neceſſary in this Buſineſs, by keeping to the Doctor's Principles, as will be evident from the following Articles; ſome of which are already well known; yet it was thought convenient to annex them to this Diſcourſe, by

Your moſt humble Servant,

John Robertſon.

Article I. *If the Circumference of a Circle be divided into any Number of equal Parts by as many* Radii, *and a Line be drawn from the Circumference cutting thoſe* Radii, *ſo that their Parts intercepted between this Line and the Centre be in a continued decreaſing geometric Progreſſion; then will that interſecting Line be a Curve, called the proportional Spiral, and will interſect thoſe* Radii *at equal Angles.*

This

This will be evident, by ſuppoſing the *Radii* ſo near to one another, that the intercepted Parts of the Spiral may be taken as right Lines: For then there will be a Series of ſimilar Triangles, each having an equal Angle at the Centre, and the Sides about thoſe Angles proportional.

Art. II. *The ſame things ſtill ſuppoſed, the Parts of the Circumference of the Circle, reckoned from any one Point, may be taken as the Logarithms of the* Ratio's *between the correſponding Rays of the Spiral.*

For thoſe Rays are a Series of Terms in a continued geometric Progreſſion; and the Parts of the Circumference form a Series of Terms in arithmetic Progreſſion. Now the Terms of the arithmetic Series being taken as the Exponents of the correſponding Terms in the geometric Series, there will be the ſame Relation between each geometric Term and its Correlative, as between Numbers and their Logarithms. And hence the proportional Spiral is alſo called the logarithmic Spiral.

Art. III. *That proportional Spiral, which interſects its* Radii *at Angles of* 45 *Degrees, produces Logarithms that are of* Napier's *Kind.*

For, if the Difference between the firſt and ſecond Terms in the geometric Series was indefinitely ſmall, and the firſt Diviſion of the Circumference was of the ſame Magnitude; then may that Part of the Spiral, intercepted between the firſt and ſecond *Radii*, be taken as the Diagonal of a Square, two of whoſe Sides are Parts of thoſe *Radii*: Therefore the Spiral which

which cuts its Rays at Angles of 45 Degrees, has a kind of Logarithms belonging to it, ſo related to their correſponding Numbers, that the ſmalleſt Variation between the firſt and ſecond Terms in the geometric Series, is equal to the Logarithm of the ſecond Term, a Cypher being taken for the Logarithm of the firſt. But of this kind are the hyperbolical Logarithms, or thoſe firſt made by their Inventor the Lord *Napier:* Conſequently the Logarithms to that Spiral which cuts its Rays at Angles of 45 Degrees, are of the *Napierian* Kind.

Art. IV. *The Rhumb-Lines on the Globe are analogous to the logarithmic Spiral.*

For every oblique Rhumb cuts the Meridian at equal Angles: And it is a Property in ſtereographic Projections, that the Lines therein interſecting one another, form Angles equal to thoſe which they repreſent on the Sphere. Therefore a Projection of the Sphere being made on the Plane of the Equator, the Meridians will become the *Radii* of the Equator, and the Rhumbs interſecting them at equal Angles, will become the proportional Spiral.

Hence, the Arcs of the Equator, or the Differences of Longitude reckoned from the ſame Meridian, are as the Logarithms of thoſe Parts of the correſponding Meridians, intercepted between the Centre and Rhumb-Line.

Art. V. *A Sea Chart being conſtructed, wherein the Meridians are parallel to one another, and the Lengths of the Degrees of Latitude increaſe in the ſame Proportion as the meridional Diſtances*

ſtances decreaſe on the Globes, will conſtitute a Mercator's Chart; wherein, beſides the Poſitions of Places having the ſame Proportions to one another as on the Globes, the rhumb Lines will be repreſented by right Lines.

For none but right Lines can cut at equal Angles ſeveral parallel right Lines.

Art. VI. *The Diviſions of the meridian Line on a Mercator's Chart, are the ſame as a Table of the Differences of Longitude anſwering to each Minute, or ſmall Difference of Latitude on the rhumb Line making Angles of 45 Degrees with the Meridians.*

For, in ſuch a Chart, the Parallels of Latitude are equal to the Equator, and are at right Angles to the Meridians: And therefore a Rhumb of 45 Degrees cuts the Meridians and Parallels of Latitudes at equal Angles; conſequently between the Interſection of any Meridian and Parallel, and a Rhumb cutting them at 45 Degrees, there muſt be equal Parts of the Meridian and Parallel intercepted: Now, on the Equator, or Parallels of Latitude, are reckoned all the ſucceſſive Differences of Longitudes, and on the Meridians the ſucceſſive meridional Differences of Latitudes, or the Diviſions of the nautical Meridian: Therefore on the Rhumb of 45 Degrees, the ſucceſſive Differences of Longitude are equal to the correſponding Diviſions of the nautical Meridian.

Art. VII. *The Tangents of the Angles which different Rhumbs make with the Meridians, are directly proportional to the Differences of Longi-*

tudes made on thoſe Rhumbs, when the meridional Differences of Latitudes are equal; or, are reciprocally proportional to unequal meridional Differences of Latitudes on thoſe Rhumbs, when the Differences of Longitudes are equal.

For the meridional Difference of Latitude, is to the Difference of Longitude; as *Radius* is to the Tangent of the Angle of the Courſe, or of the Angle which the Rhumb makes with the Meridian. Therefore, when the meridional Differences of Latitudes are equal, the Differences of Longitudes are as the Tangents of the Courſes: But, when the Differences of Longitudes are equal, the meridional Differences of Latitudes are reciprocally as the Tangents of the Courſes.

Art. VIII. *The logarithmic Tangents of the Half-Complements of the Latitudes, are analogous to the lengthen'd Degrees in the nautical Meridian Line, in a Mercator's Chart.*

For, in the ſtereographic Projection of the Sphere on the Plane of the Equator, the Latitudes of Places are projected by the Half-Tangents of the Complements of thoſe Latitudes, which Half-Tangents are the Rays of a proportional Spiral: Now, if a Series of ſucceſſive Latitudes be taken on any Rhumb, the correſponding Differences of Longitudes will be Logarithms to the Rays of the Spiral, or to the Tangents of the Half-Complements of thoſe Latitudes: Therefore the Differences of Longitudes are as the logarithmic Tangents of the Half-Complements of the Latitudes: But (*Art.* VI.) the lengthened Degrees on the nautical

nautical Meridian are as the Differences of Longitudes on the Rhumb of 45 Degrees; conſequently the logarithmic Tangents of the Half-Complements of Latitudes are as the lengthened Degrees on the nautical Meridian.

Corol. 1. When the Angle between the rhumb Line and the Meridian is equal to 45 Degrees, then the Longitudes of Places on that Rhumb are expreſſed by Logarithms of *Napier*'s Kind; whoſe correſponding Numbers are natural Tangents of the Half-Complements of the Latitudes to Arcs expreſſed in Parts of the *Radius*.

Corol. 2. Hence, to any two Places on a Rhumb of 45 Degrees, the Difference of Longitude, or the meridional Difference of Latitude, is equal to the Difference of the *Napierian* logarithmic Tangents of the Half-Complements of the Latitudes of thoſe Places, eſtimated in Parts of the *Radius*.

Corol. 3. As there may be an indefinite Variety of Rhumbs, and therefore as many different Kinds of Logarithms, conſequently every Species of Logarithms has its peculiar Rhumb, diſtinguiſhable by the Angle it makes with the Meridian: Therefore, among theſe there are two Kinds, whereto the Differences of Longitudes are the Differences of the logarithmic Tangents of the Half-Complements of Latitudes, eſtimated in Minutes of a Degree; one of them belonging to *Napier*'s Form of logarithmic Tangents, and the other to *Briggs*'s, or the common logarithmic Tangents.

Art. IX. *The common logarithmic Tangents are a Table of the Differences of Longitudes, to every*

Minute of Latitude, on the rhumb Line making Angles with the Meridians of 51° 38′ 9″.

For, let z repreſent the meridional Difference of Latitude between two Places on the Rhumb of 45 Degrees; or its Equal, the Difference between the logarithmic Tangents of the Half-Complements of the Latitudes of thoſe Places, eſtimated either in Parts of the *Radius*, or in Minutes of a Degree. Then,

As the Circumference in Parts of the *Radius* = 62831,853 *&c.*

To the Circumference in Minutes of a Degree = 21600.

So is a meridional Difference of Latitude in Parts of the *Radius* = z.

To a meridional Difference of Latitude in Minutes of a Degree, = 0,34377468 *&c.* × z.

Whoſe correſponding Rhumb is different from that which z belonged to; and the Angle which this Rhumb makes with the Meridian, will be found by the following Analogy from *Art.* 7.

As the meridional Difference of Latitude on one Rhumb = 0 34377468 *&c.* z.

To the meridional Difference of Latitude on a Rhumb of 45 Degrees, = z.

So is the natural Tangent of the Rhumb of 45 Degrees, = 10000.

To the natural Tangent of the other Rhumb, = 29088,821; *&c.*

Which Tangent anſwers to 71° 1′ 42″; and this is the Angle that the rhumb Line makes with the Meridians, on which the Differences of the logarithmic Tangents

Tangents of the Half-Complements of the Latitudes, in *Napier's* Form, are the true Differences of Longitudes eſtimated in ſexageſimal Parts of a Degree.

Now *Napier's* Logarithms being to *Briggs's* as 2,30258 *&c.* is to 1.

Therefore, 2,30258 *&c.* : 1 :: 29088,821 *&c.* : 12633,114 *&c.*; which is the Tangent of 51° 38′ 9″; and in this Angle are the Meridians interſected by that Rhumb, on which the Differences of *Briggs's* logarithmic Tangents of the Half-Complements of the Latitudes, are the true Differences of Longitudes correſponding to thoſe Latitudes.

Art. X. *The Difference between* Briggs's *logarithmic Tangents of the Half-Complements of the Latitudes of any two Places, to the meridional Difference of Latitude in Minutes between thoſe Places, is in the conſtant Ratio of* 1263,3 *&c.* to 1; or of 1 to 0,0007915704 *&c.*

For *Briggs's* logarithmic Tangents are as the Differences of Longitudes on the Rhumb (*A*) of 51° 38′ 9″; whoſe natural Tangent is 1263,3 *&c.*

The nautical Meridian is a Scale of Longitudes on the Rhumb (*B*) of 45 Degrees, by *Art.* VI. whoſe Tangent being equal to the *Radius*, may be expreſſed by Unity. And the Differences of Longitude to equal Differences of Latitudes on different Rhumbs, being to each other as the Tangents of the Angles thoſe Rhumbs make with the Meridians. Therefore,

As the Tangent of *A* (51° 38′ 9″) = 1,2633, *&c.*
To the Tangent of *B* (45°) = 1,0000;

So

So is the Difference of Longitudes on *A*, or the Difference between the logarithmic Tangents of the Half Co-latitudes of two Places

To the Difference of Longitudes on *B*, or the meridional Difference of Latitudes of thoſe Places.

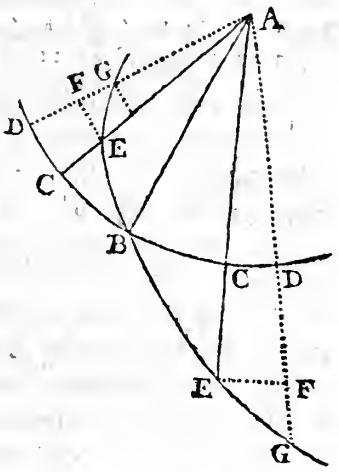
And hence ariſe the Ruſes which are given in nautical Works, for finding the meridional Parts by a Table of common logarithmic Tangents.

This curious Diſcovery of Dr. *Halley*'s, joined to that excellent Thought of his, of delineating the Lines, ſhewing the Variation of the Compaſs, on the nautical Chart, are ſome of the very few uſeful Additions made to the Art of Navigation within the laſt 150 Years: For if, beſide theſe, we except the Labours of that ingenious Artiſt Mr. *Richard Norwood*, who improved the Art by adding to it the Manner of ſailing in a Current, and by finding the Meaſure of a Degree on a great Circle, the Theory of Navigation will be found nearly in the ſame State in which it was left by that eminent Mathematician Mr. *Edward Wright*; who, about the Year 1600, publiſhed the Principles on which the true nautical Art is founded; and ſhewed, what does not appear to have been known before, how to eſtimate a Ship's true Place at Sea, as well in Longitude as in Latitude, by the Uſe of a Table of meridional Parts, firſt made by himſelf, and conſtructed by the conſtant Addition of the Secants, and which differs almoſt inſenſibly from ſuch a Table made on Dr. *Halley*'s Principles, contained in the preceding Articles.

I ſhall conclude this Diſcourſe with an Article, which, altho' it be ſomewhat foreign to the preceding Subject, yet, as it was diſcover'd while I was contemplating

templating ſome Part thereof, and perhaps is not exhibited in the ſame View by others, it may not be improper to annex it in this Place: Which is to demonſtrate this common logarithmic Property, that *the Fluxion of a Number divided by that Number, is equal to the Fluxion of the* Napierian *Logarithm of that Number.*

Let BEG be a logarithmic Spiral, cutting its Rays at Angles of 45 Degrees: Then, if AE be taken as a Number, BC will be its *Napierian* or hyperbolic Logarithm.



Alſo, let CD expreſs the Fluxion of the Logarithm BC; and the corresponding Fluxion of the Number AE, will be repreſented by FG, or its Equal FE; as the Angles FEG and FGE are equal.

Now, $AC : CD :: AE : (EF=)\ FG.$

Therefore $CD = \frac{FG}{AE} \times AB.$

And if AB be taken as the Unit or Term from whence the Numbers begin:

Then $CD = \frac{FG}{AE}$. *Q. e. d.*

VII.

VII. Obſervatio Eclipſeos Lunaris totalis cum mora, habi *Wittembergæ*, 1750, die 19 *Junii*, tubo 6 ped. p correctione horologii, quadrante teleſcopico 18 digitorun altitudines Solis correſpondentes die 19 *Junii*, per *G. M Böſe*, Phyſic. Prof. *Wittembergæ*, &c.

Read Nov. 22, 1750.

h	′	″	alt. ⊙is	h	′	″	h	′	″	h	′	″		h	′
8	11	4	38° 34	3	47	40	23	58	44	11	59	22	hinc meridies	11	59
	12	30	38 44		46	9		58	39		59	19½	correctio ob declin. ſolis		—
	18	17	39 40		40	31		58	48		59	24	meridies correct.	11	59
	20	23	40 0		38	39		59	2		59	31	et correctio horolologii		+
	23	30	40 25		35	17		58	47		59	23½			
	27	36	41 0		31	23		58	59		59	29½			
	29	4	41 15		30	2		59	6		59	33			

Cœlum ortum verſus denſis ſemper nubibus tectum. Tandem

temp. horol. h	′	″	temp. corr. h	′	″	
10	50	0	10	50	37	Luna ad momentum viſibilis. Emerſio diu præterierat.
	54	0		54	37	Ariſtarchus jam detectus.
	58	13		58	50	partes lucidæ 3rev. 220° hoc eſt 9′ 49″
11	0	22	11	0	59	4 75 11 26
	3	36		4	13	4 192 12 19
	6	3		6	40	5 37 13 52
	9	53		10	30	5 245 15 26
	12	1		12	38	5 349 16 13
	14	8		14	45	6 152 17 27
	16	9		16	46	6 321 18 43
	18	32		19	9	7 122 19 56
	20	40		21	17	7 265 21 1
	23	7		23	44	7 319 21 25
	25	16		25	53	8 55 22 9

Vix credo ex eclipſibus lunaribus differentiam meridianorum tuto erui.

temp. horol. h	′	″	temp. corr. h	′	″	
11	40	0	11	40	37	finis umbræ veræ, mihi.
	40	40		45	17	finis, amico tubo quadrantis 1½ ped.
				40	30	finis, ex projectione amici.
				39	38	finis, ex calendario correcto Lipſ.
				39	11	finis, *ſuivant* la Connoiſſance des temps.
				39	46	finis, ex ephemeridibus Manfredii.

adhibita differentia ridianorum quam per merc. in ſole de minavi, et qua ut Acad. Pariſin. in d *Connoiſſance*.

	rev.	°		hoc eſt	′	″	
Diameter Lunæ micrometro =	11	142			30′	57″	
Ejusdem semidiameter Lunæ =	.	.	.	.	15	28½	
Eadem, ſecundum Nicaſium Grammatici =				.	15	25	Vide *Roſt*'s Tab. 12.
ſecundum J. Gauppium,	.	.	.	.	15	23	Aſtronom. Tab. 13.
ſecundum calendarium Lipſienſe	.	.		.	15	32	

VIII. *Two Letters from the Rev.* Henry Miles *F.R.S. D.D. to Mr.* Henry Baker *F.R.S. concerning the* Heat *of the* Weather *in* July *and* September *laſt.*

I.

Dear Sir,

Read Nov. 22. 1750. I SEND you a brief Account of the State of the Weather, in this Place, on the 11th Inſtant, when the remarkable Storm happened; which, if you think fit, may be communicated to the *Royal Society*, when they meet; as there will probably be other Particulars relating to it ſent in.

The Morning at 4 had nothing remarkable: At 2 *p. m.* the Heavens moſtly clear, and no Indications of a Storm; the Barometer having fallen but $\frac{6}{100}$ Inch ſince 4 *a. m.* it then ſtood at 30, 20. the Thermometer at $87\frac{1}{2}$, and before 3 *p. m.* at $88\frac{1}{4}$, which is the hotteſt Temperature of the Air I ever knew.

At 4 *p. m.* we had very diſtant Thunder; ſoon after it came a little nearer, and was one continued Murmur, without any perceivable Intermiſſion for great Part of an Hour: The Lightning accompanying it, not much. The Wind was nearly S. W. and dark Clouds paſſed by on each Side of us till they united in the N. forming one of the blackeſt Clouds I ever ſaw, over the City, as near as I could gueſs. We had not one Drop of Rain, nor did there fall either Rain or Hail for near 3 Miles to the N. of us towards *London:* A few Hail-ſtones, I am informed, fell in ſome Parts of *Clapham*; what the

of the Storm might be on other Sides of the City I have not heard.

By the Obſervation I made, there did not appear any conſiderable Change in the State of the Air, as to the Weight or Heat of it. The Barometer fell little, and the Thermometer no more than uſual at that time of the Evening. Mr. *Canton* writes me, that his Thermometer in *Spital Square* (of the ſame Conſtruction with mine, and kept too in the open Air) fell no leſs than 17 Degrees. I am,

Tooting, July 18, 1750.

Dear Sir,

Your, and the Royal Society's,

moſt obedient, and

moſt humble Servant,

H. Miles.

II.

Tooting, September 2, 1750.

AT 4 *a. m.* the Wind being eaſterly, and blowing ſtrong, accompanied with ſeveral ſhort Showers of Rain, the Barometer being at 29,97, I obſerved my Thermometer abroad to ſtand at 61: A Degree of Heat exceeding any I have taken notice of during the whole Summer at that time of the Morning.

H. Miles.

IX.

IX. *Extract of a Letter from Mr.* William Arderon *F. R. S. to Mr.* H. Baker *F. R. S. concerning the* hot Weather *in* July *laſt.*

Dear Sir,

Read Nov. 22. 1750. THIS Letter waits upon you with my Obſervations on the late hot Weather; which, for 12 Days paſt, has been here at *Norwich* the moſt exceſſive I ever knew. The Beginning of this Heat was on the 8th of this inſtant *July*; on which (tho' the whole Day was cloudy) the Ground was ſo uncommonly hot, that I could not bear to walk on it long together without much Uneaſineſs; and many were ſenſible of the ſame Inconvenience as well as myſelf.

On *Wedneſday* the 11th, which was the hotteſt Day of all, my Thermometer in the Sun's Rays ſtood 11 Degrees above the Heat of human Blood; and in the Shade, in my Houſe, only 8 Degrees below it. The Diſtance between Freezing and the Heat of human Blood being divided into 100 Parts.

An Inch of Tallow, $\frac{6}{10}$ of an Inch in Diameter, liquefied in the Sun in leſs than 30 Minutes. A Piece of Reſin, $\frac{5}{10}$ of an Inch in Diameter, became ſo ſoft as to be liable to take any Impreſſion in the ſame time.

But, that you may form a better Judgment of the Heat at *Norwich*, on the ſaid 11th Day of *July*, and for three Days before, and for 3 Days after, you will ſee below how *Hauksbee*'s Thermometer ſtood at different Times in each of thoſe Days.

July 8	Morning	7	33
	Evening	10	25
July 9	Morning	7	26
	Evening	2	15
	Evening	10	18
July 10	Morning	7	24
	Evening	2	11
	Evening	10	16
July 11	Morning	7	19
	Evening	2	$8\frac{1}{2}$ = 1026 = 83
	Evening	10	16
July 12	Morning	7	18
	Evening	2	12
	Evening	10	16
July 13	Morning	7	18
	Evening	2	12
	Evening	10	16
July 14	Morning	7	32
	Evening	2	13
	Evening	10	29

Reaum. Fahr.

I obſerve 3 o' Clock in the Afternoon, when the Sky is clear, is the hotteſt Part of the Day; but Clouds moſtly came on about that time on theſe Days.

Many People here, who judged by their outward Senſes only, without paying any Regard to Thermo-

meters,

meters, have thought the 11th of *June* 1748 was hotter: But I imagine the Reaſon to be, that the Heat this Year came on gradually from Day to Day; whereas in the Year 1748 it was much more ſudden; the Thermometer then riſing 22 Degrees more in one Day than the preceding; which, conſequently, would make the Difference between one Day and another appear the more extraordinary. But, by my Obſervations on the 11th of *June* 1748, *Hauksbee*'s Thermometer ſtood at $14\frac{1}{2}$; full 6 Degrees cooler than on the 11th of this preſent *July*. I am,

SIR,

Norwich, July 23. 1750.

Your moſt humble Servant,

William Arderon.

P. S. Several Horſes have dropped down dead under their Maſters, overcome by this violent Heat.

X. *A total Eclipſe of the* Moon, *obſerved* Dec. 2, 1750. *in the Morning in the* Strand, London, *about* 5″ *of Time Weſt of* St. Paul's, *and* 27″ *Weſt of the* Royal Obſervatory *at* Greenwich; *by Dr.* Bevis *and Mr.* James Short *F. R. S.*

Read Dec. 13. 1750.

	h	′	″
A SENSIBLE *Penumbra* (*Dec.* 1.) at	16	32	0
The Eclipſe judged to begin at		36	50

Grimaldi

	h	′	″
Grimaldi covered . . .		40	20
Shadow touches *Mare Humorum* .		45	26
at the Middle of *Kepler* .		48	40
at the Middle of *Ariſtarchus*		50	7
touches *Copernicus* . .		55	23
Copernicus half-cover'd .		56	56
——— quite cover'd .		58	5
Timocharis half-cover'd .		59	0
Shadow touches *Tycho* . .		59	20
at the Middle of *Tycho* .	17	0	0
covers *Tycho* . .		1	3
at the Middle of *Menelaus* .		14	42
touches *Goclenius* . .		24	29
covers *Goclenius* . .		25	17
at the Middle of *Proclus* .		27	20
touches *Mare Criſium* .		28	44
at the Middle of *Mare Criſium*		31	15
covers *Mare Criſium* .		33	30
Total Immerſion at . . .		36	5
The Moon begins to emerge . .	19	14	33
Grimaldi begins to emerge . .		16	4
quite uncover'd . .		18	10

The Moon was now got ſo low, and Day-light ſo far advanced, that no more Phaſes could be obſerved with any Degree of Certainty.

Theſe Obſervations were made with a reflecting Teleſcope, that magnified 40 times, and a refracting Teleſcope, which magnified 12 times; and the Times were the ſame thro' theſe two Teleſcopes; for the Air was exceeding clear, and the Shadow well defined, the *Penumbra* being ſcarce ſenſible.

Here

Here follows a Computation, made from Dr. *Halley*'s Tables, by Mr. *John Catlin*, of *Guy*'s Hoſpital; and ſent to Mr. *Short* the Day before the Eclipſe.

Dec. 1. in the Morning 1750.	h	′	″
Beginning of the Moon's Eclipſe .	16	44	31
Immerſion at . . .	17	42	45
Emerſion at . . .	19	20	37
End at	20	18	51

From hence it appears, that the Eclipſe began about 8 Minutes ſooner than the Computation from Dr. *Halley*'s Tables gave it; but the Computation which Mr. *Brent* made and publiſhed ſome time before the Eclipſe happen'd, was within a Minute of the Time obſerved; and this Exactneſs he imputes to his leaving out three of the ſeven Equations of the Moon, publiſhed by Sir *Iſaac Newton* in his Theory of the Moon.

XI.

XI. *An Account of ſome Experiments, made by* Benjamin Robins *Eſq; F. R. S. Mr.* Samuel Da Coſta, *and ſeveral other Gentlemen, in order to diſcover the Height to which* Rockets *may be made to aſcend, and to what Diſtance their* Light *may be ſeen; by Mr.* John Ellicott *F. R. S.*

Read Dec. 13. 1750. SOON after the Exhibition of the Fire-works * in the *Green Park*, Mr. *Robins* communicated to this *Society* an Account of the Height to which ſeveral of the Rockets there fired were obſerved to riſe. In this Account, after having given a ſhort Deſcription of the Inſtrument with which the Heights were meaſured, he obſerves, that the cuſtomary Height to which the ſingle or honorary Rockets, as they are ſtiled, aſcended, was about 465 Yards; that three of them roſe to about 550 Yards; and the greateſt Height of any of thoſe fired in the grand *Girandole* was about 600 Yards. He likewiſe further obſerved, that, ſuppoſing Rockets are made to aſcend 600 Yards, or more than a Third of a Mile, it follows, that if their Light be ſufficiently ſtrong, and the Air not hazy, they may be ſeen in a level Country at above 50 Miles Diſtance; and that, from the Nature of the Compoſition, and the uſual imperfect Manner of forming them, he was of Opinion that Rockets were capable of being greatly improved, and made to reach much greater Diſtances.

Mr.

* On Occaſion of the late Peace.

Mr. *Robins* not having been able to obtain any certain Account to what Diſtance any of theſe Rockets were actually ſeen, and conſidering the great Uſe that might be made of Rockets in determining the Poſition of diſtant Places, and in giving Signals for naval and military Purpoſes, he reſolved to order ſome Rockets to be fired at an appointed Time, and to deſire ſome of his Friends to look out for them at ſeveral very diſtant Places.

The Places fix'd upon for this Purpoſe, were, *Godmarſham* in *Kent*, about 50 Miles diſtant from *London*; *Beacon Hill* on *Tiptery-Heath* in *Eſſex*, at about 40 Miles; and *Barkway*, on the Borders of *Hertfordſhire*, about 38 Miles from *London*.

Mr. *Robins* accordingly order'd ſome Rockets to be made by a Perſon many Years employ'd in the Royal Laboratory at *Woolwich*; to which ſome Gentlemen, who had been inform'd of Mr. *Robins*'s Intentions, added ſome others of their own making. The 27th of *September*, 1749. at 8 in the Evening, was the Time appointed for the firing of them; but, thro' the Negligence of the Engineer, they were not let off till above half an Hour after the Time agreed upon. There were in all a dozen Rockets fired from *London Field* at *Hackney*; and the Heights were meaſur'd by Mr. *Canton*, Mr. *Robins* being preſent, at the Diſtance of about 1200 Yards from the Poſt from whence the Rockets were fir'd. The greateſt Part of them did not riſe to above 400 Yards; one to about 500, and one to 600 Yards nearly.

By a Letter I receiv'd the next Day from the Rev. Dr. *Maſon*, of *Trinity College*, *Cambridge*,

who had undertaken to look out for them from *Barkway* on the Borders of *Hertfordſhire*, I was informed, that, having waited upon a Hill near the Town with ſome of his Friends till about half an Hour paſt the Time appointed, without perceiving any Rockets, as they were returning to the Town, ſome of the Company ſeeing thro' the Trees what they took to be a Rocket, they immediately haſten'd back out of the Cloſes into the open Fields, and plainly ſaw 4 riſe, turn, and ſpread: He judged they roſe about one Degree above the Horizon, and that their Lights were ſtrong enough to have been ſeen much farther.

From *Eſſex* I was inform'd, that the Perſons on *Tiptery-Heath* ſaw 8 or 9 Rockets very diſtinctly, at about half an Hour paſt 8; and likewiſe greatly to the Eaſtward of theſe 5 or 6 more. The Gentlemen from *Godmarſham* in *Kent* having waited till above half an Hour paſt 8, without being able to diſcern any Rockets, they fired half a dozen; which, from the Bearings of the Places were moſt probably thoſe ſeen to the Eaſtward by the Perſons upon *Tiptery Heath*; and if the Situations, as laid down in the common Maps, are to be depended upon, at about 35 Miles Diſtance.

The Engineer being of Opinion that he could make ſome Rockets, of the ſame Size as the former, that ſhould riſe much higher, Mr. *Robins* order'd him to make half a dozen. Theſe laſt were fired the 12th of *October* following, from the ſame Place, and in general they roſe nearly to the ſame Heights with the foregoing; excepting one which was obſerved to riſe 690 Yards. The Evening proy'd very hazy,

hazy, which render'd it impoſſible for them to be ſeen to any conſiderable Diſtance.

It being obſerv'd in theſe Trials, that the largeſt of the Rockets, which were about 2 Inches and a half in Diameter, roſe the higheſt, Mr. *Robins* intended to have made ſome more Experiments, in order to a farther Diſcovery what ſiz'd Rockets would riſe higheſt: But his Engagements with the *Eaſt India* Company preventing him, Mr. *Samuel Da Coſta* late of *Devonſhire-Square*, a Gentleman of an extraordinary Genius in Mechanics, and indefatigable in the Application, Mr. *Banks*, a Gentleman who had for many Years practis'd making Rockets, and two other Perſons, undertook the proſecuting theſe Enquiries; and having made ſeveral Experiments as well with regard to the Compoſition, as the Length which Rockets might be made to bear, in proportion to their Diameters, and of different-ſiz'd Rockets, from 1 Inch and a half to 4 Inches Diameter, they intended this Winter to have made Trial of ſome of a yet greater Diameter, had not the Death of Mr. *Da Coſta* prevented it.

I ſhall therefore beg Leave to give ſome Account of the Succeſs which has hitherto attended their Undertaking, ſo far as they went: And as it has been much beyond what was expected, I am in hopes this ſhort Relation will not prove unacceptable.

Amongſt ſome Rockets fired in the laſt Spring, there were two made by Mr. *Da Coſta* of about 3 Inches and a half Diameter, which were obſerved to riſe, the one to about 833, the other to 915 Yards. At a ſecond Trial, made ſome time after,

there was one made by Mr. *Da Coſta*, of 4 Inches Diameter, which roſe to 1190 Yards. The laſt Trial was made the latter End of *April* 1750, where 28 Rockets were fired in all, made by different Perſons, and of different Sizes, from 1 Inch and a half Diameter to 4 Inches; the moſt remarkable of each Size were as follows; one of 1 Inch and a half roſe to 743 Yards; one of 2 Inches to 659; one of 2 Inches and a half to 880; another of the ſame Size, which roſe to 1071; one of 3 Inches to 1254; one of 3 Inches and a half to 1109; and one of 4 Inches; which, after having roſe to near 700 Yards, turned, and fell very near the Ground before it went out. Theſe were all made by Mr. *Da Coſta*. Beſides theſe, there was one of the Rockets of $2\frac{1}{2}$ Inches in Diameter, which roſe to 784 Yards, and another made by Mr. *Banks* of the ſame Size to 833.

As the making of large Rockets is not only very expenſive, but likewiſe more uncertain than thoſe of a leſſer Size, ſo from the laſt Experiments it is evident, that Rockets from 2 Inches and a half to $3\frac{1}{2}$ Inches Diameter, are ſufficient to anſwer all the Purpoſes they are intended for; and I doubt not may be made to riſe to an Height, and to afford a Light capable of being ſeen to conſiderably greater Diſtances than thoſe before-mention'd.

Before I conclude this Account, it may not be improper to take notice, that, tho' the Heights of the Rockets are ſet down to a ſingle Yard, it is not pretended the Method made uſe of (tho' ſufficient for all the Purpoſes of theſe Experiments) is capable of determining the Heights to ſo great an Exactneſs:

actneſs; for, as they were meaſur'd by only one Obſerver, it is evident, that, if any of the Rockets deviated from the Perpendicular, ſo as either to incline towards the Place of Obſervation, or to decline from it, the Height would be given either greater or leſs than the Truth; but as the Baſe upon which they were meaſur'd was 1190 Yards, the greateſt Error that can ariſe on this Account will be but very inconſiderable. If we ſhould ſuppoſe there might be an Error of 30 or even 50 Yards, which is very highly improbable, it muſt then be allowed, that ſeveral of theſe Rockets roſe to 1000 Yards, one to 1100, and another to 1200 Yards, or double to any of thoſe fired in the *Green Park*.

I have been informed, that the Relation of this Affair has appeared ſo very extraordinary to ſome Gentlemen converſant in ſuch Matters, that they have mention'd it as their Opinion, that there muſt certainly have been ſome Miſtake, either in placing the Inſtrument, taking the Heights, or otherwiſe. In anſwer to which I would obſerve, that, in all the Experiments mentioned in this Paper, the Heights were all taken by the ſame Perſon, *viz.* Mr. *John Canton*, and that the laſt Trial was made in the Preſence of ſeveral very worthy Members of this *Society*. That the Inſtrument, being firſt fixed to a proper Angle was not alter'd during the whole Time of Trial; and therefore, if there had been any Miſtake in fixing it, that Miſtake would have varied the Height of all the Rockets as much as thoſe of Mr. *Da Coſta's*; but it was thoſe of Mr. *Da Coſta's* only, and that at three different Trials, which roſe to ſuch extraordinary Heights;

and

and therefore I think we have ſufficient Reaſon to conclude that their Meaſures were certainly taken very near the Truth.

John Ellicott.

XII. *Several* Papers *concerning a new* Semi-Metal, *called* Platina; *communicated to the* Royal Society *by Mr.* Wm. Watſon *F. R. S.*

I.

Extract of a Letter from William Brownrigg *M. D. F. R. S. to* Wm. Watſon *F. R. S.*

Dear Sir, *Whitehaven, Dec.* 5, 1750.

Read Dec. 13, 1750. I TAKE the Freedom to incloſe to you an Account of a Semi-metal call'd *Platina di Pinto*; which, ſo far as I know, hath not been taken notice of by any Writer on Minerals. Mr. *Hill*, who is one of the moſt modern, makes no mention of it. Preſuming therefore that the Subject is new, I requeſt the Favour of you to lay this Account before the *Royal Society*, to be by them read and publiſhed, if they think it deſerving thoſe Honours. I ſhould ſooner have publiſhed this Account, but waited, in hopes of finding Leiſure to make further Experiments on this Body with ſulphureous and other Cements; alſo with Mercury, and ſeveral corroſive *Menſtrua*. But theſe Experiments I ſhall now defer, until I learn how the above is receiv'd. The Experiments which I have related were ſeveral of them made by a Friend, whoſe Ex-

actneſs in performing them, and Veracity in relating them, I can rely on: However, for greater Certainty, I ſhall myſelf repeat them I am, dear Sir,

Your moſt obedient Servant,

W. Brownrigg.

II.

Memoirs of a Semi-metal called Platina di Pinto, *found in the* Spaniſh Weſt Indies.

ALTHO' the Hiſtory of Minerals, and other foſſil Subſtances, hath been diligently cultivated, eſpecially by the Moderns; yet it muſt be acknowleged, that, among the vaſt Variety of Bodies which are the Objects of that Science, there ſtill remains Room for new Inquiries.

No Wonder that, among the great, and almoſt inexhauſtible Varieties of Salts, Ores, and other Concretes, new Appearances, and Mixtures before unknown, ſhould daily be diſcover'd: But that, among Bodies of a more ſimple Nature, and particularly among the metalline Tribe, ſeveral diſtinct Species ſhould ſtill remain almoſt wholly unknown to Naturaliſts, will doubtleſs appear more ſtrange and extraordinary.

Gold is uſually eſteem'd the moſt ponderous of Bodies; and yet I have ſeen, in the Poſſeſſion of the late Profeſſor *s'Graveſande*, a metalline Subſtance, brought from the *Eaſt Indies*, that was ſpecifically heavier than Gold, by at leaſt a twentieth Part. Mercury, next to Gold, is commonly ſaid to be the heavieſt Body; yet Mercury is greatly exceeded in ſpecific Gravity by

by a Semi-metal brought from the *Weſt Indies*, whereof I have now the Honour to preſent Specimens to the *Royal Society*. And this Semi-metal ſeems more particularly to deſerve our Attention, as it is endu'd with ſome very ſingular Qualities, which plainly demonſtrate that certain general Theorems, tho' long eſtabliſh'd, and univerſally receiv'd by the Metallurgiſts, yet do not hold true in all Caſes, and ought not to be admitted into their Arts, without proper Limitations and Reſtrictions. For inſtance, *That Gold and Silver may be purified from all heterogeneous Subſtances by Coppellation*, is a Propoſition that all Aſſayers and Renners have long thought true and undeniable; yet this Propoſition ought not to be receiv'd by thoſe Artificers, without an Exception to the Semi-metal here treated of; ſince, like thoſe nobler Metals, it reſiſts the Power of Fire, and the deſtructive Force of Lead in that Operation.

This Semi-metal was firſt preſented to me about nine Years ago, by Mr. *Charles Wood*, a skilful and inquiſitive Metallurgiſt, who met with it in *Jamaica*, whither it had been brought from *Carthagena* in *New Spain*. And the ſame Gentleman hath ſince gratified my Curioſity, by making further Inquiries concerning this Body. It is found in conſiderable Quantities in the *Spaniſh Weſt Indies* (in what Part I could not learn) and is there known by the Name of *Platina di Pinto*. The *Spaniards* probably call it *Platina*, from the Reſemblance in Colour that it bears to Silver. It is bright and ſhining, and of a uniform Texture; it takes a fine Poliſh, and is not ſubject to tarniſh or ruſt; it is extremely hard and compact; but, like Bath-metal, or caſt Iron, brittle, and cannot be extended under the Hammer.

The

The *Spaniards* do not dig it in the Form of Ore, but find it in Duſt, or ſmall Grains, as herewith preſented to the *Royal Society*. Whether they gather it in a pretty pure State, as brought to us, or waſh it, like Gold-duſt, from among Sand, and other lighter Subſtances, is to me unknown: However, it is ſeldom collected perfectly pure; ſince, among ſeveral Parcels of it that I have ſeen, I conſtantly obſerv'd a large Mixture of a ſhining black Sand, ſuch as is found on the Shores of *Virginia* and *Jamaica*, which is a rich iron Ore, and anſwers to the Magnet. It hath alſo uſually mix'd with it ſome few ſhining Particles of a golden Colour, which ſeem to be a Subſtance of a different Nature.

It is very probable that there is great Plenty of this Semi-metal in the *Spaniſh Weſt Indies*; ſince Trinkets made of it are there very common. A Gentleman of *Jamaica* bought five Pounds of it at *Carthagena* for leſs than its Weight of Silver; and it was formerly ſold for a much lower Price.

When expoſed by itſelf to the Fire, either in Grains, or in larger Pieces, it is of extreme difficult Fuſion; and hath been kept for two Hours in an Air-Furnace, in a Heat that would run down caſt Iron in fifteen Minutes: Which great Heat it endur'd without being melted or waſted; neither could it be brought to fuſe in this Heat, by adding to it Borax, and other ſaline Fluxes. But the *Spaniards* have a Way of melting it down, either alone, or by means of ſome Flux; and caſt it into Sword-hilts, Buckles, Snuff-boxes, and other Utenſils.

When expoſed to a proper Degree of Fire, with Lead, Silver, Gold, Copper, or Tin, it readily melts

" This Stone has certain Veins, or hair-like Ap-
" pearances, on its Surface; whereby it is render'd
" leſs fit for a *Speculum*, and is apt to break in
" theſe Veins in receiving any Blow. Many are
" perſuaded, or at leaſt ſuſpect, that the Matter of
" theſe is a caſt Compoſition; and although there are
" ſome Appearances of this being ſo, they are not ſuffi-
" ciently convincing. In this Country there are Gul-
" lies (*Quebradas*) where the Mineral of them is found
" rough, and from whence ſome are always taken;
" but theſe are not now wrought for thoſe Purpoſes
" for which heretofore they were employ'd by he
" *Indians:* But this is no Reaſon but that ſome
" of them may have been caſt, as with the ſame
" Material taken out of the Mine, they may have
" been made artificially, and thereby have receiv'd a
" greater Degree of Perfection, as well in their Qua-
" lity as in their Figure." He ſays further, " that,
" although at preſent, theſe, as well as ſeveral other
" things found there are but of ſmall Value, never-
" theleſs they are extremely curious, and worthy
" to be eſteem'd, as well for their great Antiquity,
" as for their being the Performances of thoſe bar-
" barous People."

Some of theſe *Piedras de Inga* I now take the Liberty of laying before the *Society*, both in their rough and in their poliſh'd State. They were brought hither with ſeveral other Curioſities from *America*, by that excellent Perſon, and my much-lamented Friend, Don *Pedro Maldonado*, and were preſented by him to our moſt worthy *Preſident*, who was pleaſed to put them into my Hands. They are doubtleſs of a metalline Subſtance, and have, in

my

my Opinion, evident Marks of having been fuſed and caſt. They very much reſemble, as you will ſee by comparing them, the *Platina* before-mention'd: And though they are call'd (*Piedras*) Stones by Don *Antonio d'Ulloa*, he likewiſe gives the ſame Appellation to the *Platina*. I cannot therefore help recommending to ſome curious Metallurgiſt of the *Society* to make the Experiment, whether or no, when the *Piedras de Inga* are, by a proper Proceſs, diveſted of their ſtony and other heterogeneous Parts, the metalline *Reſiduum* will not reſemble, as well in ſpecific Gravity (for which it is ſo remarkable) as in other Properties, the purified *Platina* now before us?

Wm. Watſon.

IV.

Read Dec. 20. 1750. IN *January* 1742-3. there were brought from *Jamaica*, in a Man of War, ſeveral Bars (as thought) of Gold, conſigned from different Merchants of that Iſland, to their different Correſpondents here, as Bars of Gold. Theſe Bars had the ſame ſpecific Gravity, or rather more than Gold, and were exactly like that Metal in Colour, Grain, *&c.* A Piece of one of theſe counterfeit Bars was ſent to the Mint to be teſted, and it was found to be twenty-one Carats three Grains worſe than Standard.

Emanuel Mendez da Coſta.

V.

lities, that may render it of ſingular Uſe and Importance to Mankind.

Specimens of Platina *preſented to the* Royal Society.

N°. 1. *Platina*, in Duſt, or minute Maſſes, mixed with black Sand, and other Impurities, as brought from the *Spaniſh Weſt Indies*.
2. Native *Platina*, ſeparated from the above-mention'd Impurities.
3. *Platina* that has been fuſed.
4. Another Piece of *Platina*, that was Part of the Pummel of a Sword.

III.

To the Royal Society.

Gentlemen, *London, Dec.* 13, 1750.

I BEG Leave to ſubjoin a few Lines to my learned and ingenious Friend Dr. *Brownrigg*'s Paper concerning the *Platina di Pinto*, or what is likewiſe call'd in *America Juan Blanco*. This Subſtance is mention'd in no Author I have met with, except by our worthy Brother Don *Antonio d'Ulloa*, who, in the Hiſtory of his Voyage to *South America*, *Vol.* II. *Book* 6. *Chap.* 10. which I have here extracted, and tranſlated from the *Spaniſh*, when giving an Account of the Gold and Silver Mines in the Province of *Quito*, and of the various Methods of ſeparating theſe Metals from other Subſtances, with which they are combin'd, ſays, that, " in the Territory of " *Choco* .... there are Gold Mines, in which that " Metal

" Metal is ſo diſguiſed and enveloped with other " mineral Subſtances, Juices, and Stones, that, for " their Separation from the Gold, they are obliged " to uſe Quickſilver. Sometimes they find mineral " Subſtances, which, from their being mixed with " *Platina*, they chuſe to neglect. This *Platina* " is a Stone (*Piedra*) of ſuch Reſiſtance, that it " is not eaſily broken by a Blow upon an Anvil. " It is not ſubdued by Calciniation; and it is very " difficult to extract the Metal it contains even with " much Labour and Expence."

In the before-mention'd Work, *Chap.* 11. the ſame Author, when ſpeaking of the remaining Works of the *Indians* of old, ſays, " the *Specula* wrought " out of Stones, which are found in the Places of " Worſhip of the *Indians*, are of two kinds, in re- " lation to the Matter of which they are made: " One of theſe is call'd *Piedra de Inga*, the other " *Piedra de Gallinazo*. The firſt of theſe is ſmooth, " of a leaden Colour, and not tranſparent; they are " uſually found wrought of a circular Figure: One " of the Surfaces is plain, and as ſmooth as though " it were made of a kind of Chryſtal; the other Sur- " face is oval, or rather ſomewhat ſpherical, and not " ſo much burniſh'd as the plain one. Although they " vary in their Size, they are commonly from three " to four Inches in Diameter; but he has ſeen one " that was a Foot and half in Diameter. Its prin- " cipal Surface was concave, and much augmented " the Size of Objects, as its Poliſh was in as great " Perfection as though it had been work'd by a dex- " trous Artiſt in theſe Times.

" This

and incorporates with theſe Metals; rendering the Mixture, like itſelf, extremely hard and brittle.

Having been melted in an Aſſay-Furnace, on a Teſt with Lead, and therewith expoſed to a great Fire for three Hours, till all the Lead was wrought off, the *Platina* was afterwards found remaining at the Bottom of the Teſt, without having ſuffer'd any Alteration or Diminution by this Operation.

A Piece of *Platina* was put into ſtrong and pure *Aqua fortis*, and therewith placed in a Sand-heat for twelve Hours: The *Platina*, when taken out of the *Aqua fortis*, was found of the ſame Weight as when put into it; being in no-wiſe diſſolved or corroded by that *Menſtruum*.

It had been reported, that this Semi-metal was ſpecifically heavier than Gold; but having weigh'd ſeveral Pieces of it hydroſtatically in a nice Aſſay-Balance, I found one of theſe Pieces to weigh in Air *gr.* $\frac{345}{8}$, and in Water *gr.* $\frac{322}{8}$: So that its ſpecific Gravity was to that of Water exactly as 15 : 1. Another Piece, that ſeem'd to be caſt very open and porous, I found in Gravity to Water only as 13.91 to 1. Altho' this laſt-mention'd Piece, could it have endur'd the Hammer as well as Gold, might probably have been reduc'd to a conſiderably greater Degree of Solidity than that of the firſt-mention'd Specimen. For the pureſt Gold is ſeldom found, after Fuſion, to come up to its true ſpecific Weight, until it hath been brought up to its greateſt Degree of Solidity under the Hammer.

I alſo weigh'd an equal Mixture of Gold and *Platina*, which I found nearly as ponderous as Gold itſelf; the ſpecific Weight of this Mixture being to that of Water as 19 to 1.

It

It hath been reported, that the *Spaniards* have ſometimes been tempted to adulterate Gold with *Platina*, as the Mixture could not be diſtinguiſh'd from true Gold by all the ordinary Trials: But the Gold thus adulterated was, upon a nicer Examination, found hard and brittle, and could not be ſeparated from the *Platina*, and render'd ductile and pure, either by Cementation, or by the more ordinary Operations with Lead and Antimony. In order therefore to prevent this Fraud, the King of *Spain* commanded that the Mines of *Platina* ſhould be ſtopped up; ſo that this Semi-metal is now much ſcarcer than formerly.

From the foregoing Account it appears, that no known Body approaches nearer to the Nature of Gold, in its moſt eſſential Properties of Fixedneſs and Solidity, than the Semi-metal here treated of; and that it alſo bears a great Reſemblance to Gold in other Particulars. Some Alchemiſts have thought that Gold differ'd from other Metals in nothing ſo much as in its ſpecific Gravity; and that, if they could obtain a Body that had the ſpecific Weight of Gold, they could eaſily give it all the other Qualities of that Metal. Let them try their Art on this Body; which, if it can be made as ductile as Gold, will not eaſily be diſtinguiſh'd from Gold itſelf.

Upon the whole, this Semi-metal ſeems a very ſingular Body, that merits an exacter Inquiry into its Nature than hath hitherto been made; ſince it is not altogether improbable, that, like the Magnet, Iron, Antimony, Mercury, and other metallic Subſtances, it may be endowed with ſome peculiar Qua-

V.

Extract of a Letter from Wm. Brownrigg *M. D. and F. R. S. to* Wm. Watſon *F. R. S. containing ſome further Experiments upon the* Platina.

Whitehaven, Feb. 13, 1750.

Read Feb. 28. 1750-51. I WAS favour'd with your Letter of *Dec.* 15, and am much obliged to you for the Trouble you took in preſenting my Specimens of the *Platina* to the *Royal Society*, together with my Memoir relating thereto; and I thank you for the Addition you made to it of the Extract of Don *d' Ulloa*'s Voyage.

The Gentleman, whoſe Experiments on *Platina* I mention'd to the *Royal Society*, was Mr. *Charles Wood*, who permitted me to make what Uſe of them I pleaſed; and I did not pretend to have made any new Diſcovery, nor to know ſo much of that Body, as hath long been known to the *Spaniards*. I might indeed have made uſe of his Authority; but he was not ambitious of appearing in Print.

The chief thing about which I had any Difficulty, was what had been aſſerted of the *Platina*'s reſiſting the Force of Lead in Coppellation. This Experiment I have tried therefore, by adding to *gr. xxvi.* of *Platina*, ſixteen times its Weight of pure Lead, that I had myſelf reduced from Litharge. To the Lead put into a Coppel, and placed in a proper Furnace; as ſoon as it was melted I added the *Platina*, which in a ſhort time was diſſolved in the Lead. After the Lead was all wrought off, there remain'd at the Bottom of the Coppel a Pellet of *Platina*, which I found to weigh only *gr. xxi.*; ſo that, in this

this Operation, the *Platina* had loſt near a fifth Part of its Weight.

According therefore to this Experiment, the *Platina* does not wholly reſiſt the Force of Lead in Coppellation; but, by repeated Operations of that kind with larger Quantities of Lead, may probably all be deſtroy'd: And by ſuch repeated Coppellations, Gold and Silver may very likely be refin'd from it; although what was before aſſerted may hold pretty true, with regard to the common Coppellations of the Aſſayers and Refiners.

Mr. *Wood* ſaid, that, in his Experiment, he thought the *Platina* rather gain'd than loſt in Weight by Coppellation. This might happen from ſome ſmall Mixture of Lead, or other Metal continuing with it after it remained no longer fuſed.

From this ſingle Experiment I will not be quite poſitive that Lead thus conſumes ſome ſmall Quantity of *Platina*, ſince it is poſſible the *Platina* uſed might not be pure. Beſides, in order to keep it longer in Fuſion, I urged on the Experiment with an uncommon Degree of Heat, eſpecially towards the End of the Operation; although I think no great Error could thence ariſe; as half a Drachm of Silver, which I coppell'd at the ſame time, had loſt only two Grains in the Operation.

I am told that one Mr. *Ord*, formerly a Factor to the *South Sea Company*, took in Payment from ſome *Spaniards* Gold, to the Value of 500 *l.* Sterling, which being mix'd with *Platina*, was ſo brittle, that he could not diſpoſe of it, neither could he get it refin'd in *London*, ſo that it was quite uſeleſs to him: Altho', if no Error hath been com-

mitted in the above-mention'd Experiments, it might probably have been render'd pure by a much larger Doſe of Lead than is uſually applied for that Purpoſe.

To my Memoir I might have added, that, attempting to cleanſe a Parcel of the native *Platina* from the black Sand, wherewith it was mixed, I found that a great many of its Grains were attracted by the Magnet I made uſe of for that Purpoſe. This Circumſtance I took notice of in a Letter to Lord *Lonſdale* two Years ago. I am,

Dear Sir,

Your moſt obliged humble Servant,

W. Brownrigg.

XIII. *An Account of a very large human* Calculus, *by* Wm. Heberden *M. D. F. R. S. and Fellow of the* Coll. *of* Phyſic. Lond.

Read Dec. 20. 1750.

THERE is preſerved in the Library of *Trinity-College* in *Cambridge*, a Stone taken from a human Bladder, which, for its uncommon Size, may deſerve the Notice of his, *Society*. It is of an oval Shape, flatted on one Side and its Surface is ſmooth. The ſpecific Gravity plainly ſhews, that it is of an animal Origin; for its Weight is to that of Water only as 1,75 to 1.

In order to get a true and well-atteſted Hiſtory of this curious Stone, the Right Rev. Dr. *Claggett*, late Biſhop of *Exeter*, was applied to, who was Keeper

Keeper of the Library at the time when it was given, and likewiſe the Rev. Dr. *Baker*, who was then a Fellow of *Trinity College*, and entertain'd the Gentleman that brought it; and laſtly, a Son in law of the very Perſon from whom it was taken. From their Accounts it appear'd, that this Stone was taken from the Wife of *Thomas Raiſin*, Lockſmith in *Bury*, after her Death, by Mr. *Gutteridge*, a Surgeon, of *Norwich*.

She had felt much leſs Pain than might have been expected from ſo large a Stone; and might probably have liv'd much longer with it, if ſhe had not thought herſelf well enough to attempt a Journey on Horſeback; for, while ſhe was riding, ſhe was ſuddenly ſeized with violent Pains, that obliged her to be taken off the Horſe immediately: After which ſhe could never make Water, unleſs the Stone was firſt moved, and ſhe continued in great Agonies till ſhe died.

This happen'd in the Reign of King *Charles* II. who being then at *Newmarket*, had the Stone brought to him; ſome Part of which was chipp'd off from one of its Ends, to ſhew the King that it conſiſted of various Coats formed one over another, as animal Stones uſually do.

Mr. *Samuel Battely*, who was Member of Parliament for *Bury*, had Poſſeſſion of this Stone, either immediately, or very ſoon after the Woman's Death, and kept it till it was preſented to *Trinity-College*. which was about the Middle of Queen *Anne*'s Reign,

This monſtrous Stone weighs 33 Ounces 3 Drachms and 36 Grains, *Troy* Weight. There appears to have been at leaſt half an Ounce broken off, on the Oc-

caſion before related; not to mention what it muſt have loſt by mere Wear in fourſcore Years.

We are told, that they have in the Hoſpitals of *Paris* human *Calculi* weighing 34 *Paris* Ounces: But this in *Trinity* Library, even at preſent, weighs 34 *Paris* Ounces all but 9 Grains; and muſt have weigh'd conſiderably more when it was whole. Yet theſe are perhaps the heavieſt that are any-where recorded; except that very extraordinary one mention'd by Dr. *Liſter*, in his *Journey to* Paris, *p.* 232; which he ſays was taken from a Monk *A. D.* 1690. and weighs 51 Ounces.

This Hiſtory may confirm to us the Uſefulneſs of endeavouring to relieve the Violence of Pain in this Diſtemper, by altering the Poſition of the Stone in the Bladder, either with the Help of the *Catheter*, or by ſome proper Alteration in the Poſture of the Patient; ſince, with reſpect to the Pain which it occaſions, the Situation of the Stone appears to be of far greater Conſequence than its Size.

XIV. *A Letter from the Rev.* Charles Lyttelton *LL. D. and F. R. S. Dean of* Exeter *to the* Preſident, *concerning a non-deſcript* petrified Inſect.

Read Dec. 20, 1750.

THE curious Foſſil I have now the Honour to exhibit to the *Society*, is as rare as its Figure is elegant; having been mention'd by none of our own Writers who treat on Foſſils,

Foſſils, and but very imperfectly deſcrib'd by foreign Lithographiſts *.

I diſcover'd a ſingle Specimen of it (*ſee* TAB. I. *Fig.* 3, 4, and 5.) laſt Year in the Limeſtone Pits at *Dudley* in *Worceſterſhire*; and very lately a large Maſs of Limeſtone (*ſee* TAB. II.) full of them in the ſame Place; both which are now ſubmitted to the Inſpection of this Learned Body, who are beſt able to determine to what Claſs of the Animal Kingdom it properly belongs. I am, Sir, with great Regard,

Hill-ſtreet, Dec. 20. 1750.

Your moſt obedient Servant,

C. Lyttelton.

---

* I ſuppoſe the *Dean* means Dr. *Bruckmann*, and the late Mr. *Linck*, an eminent Apothecary at *Lipſick:* For Dr. *Bruckmann*, in his *Centuria Epiſt. Itinerar. Wolffenbuttl.* 1742. 4°, Epiſt. XXIII. has given ſeveral Figures of Petrefactions, very much reſembling theſe *Dudley* Foſſils; the firſt was found at *Steme*, a Village in the Neighbourhood of *Paderborn*, given him by Dr. *Kœnig*, which he took for a ſort of *Polypus marinus*; he ſays it is an Animal unknown to him, but he gives thoſe Figures of it, in hopes that ſome curious Perſons, who live near the Sea, may light upon ſome Animal reſembling this. The Body of this Stone, he ſays, has, on each Side three ſtriated Lobes, and three pointed *Appendices* beneath; its inner Subſtance is white, being *Selenites*, or white Spar; Its Colour on the Outſide is every-where brown. His Friend *Linck* had ſent him Specimens of theſe Stones 6 Years before, ſome modell'd in Wax, others engraved upon Copper.

C. M.

ADDENDA

ADDENDA *to the preceding Paper.*

Extract of a Letter from the Rev. Dr. Lyttelton *to* C. Mortimer, *Secret. R. S.*

THE Rev. Dr. *Shaw*, of *Oxford*, has procured a Specimen of the extended *Eruca*. As the Foſſiliſts differ'd in their Opinion of this *Dudley* Foſſil, ſome pronouncing it an *Eruca*, others a *Bivalve*, I thought it beſt to leave the Reader to judge for himſelf from the Engravings; but, as we are now able to add a Specimen of this Foſſil in an extended Poſture, there is a better Pretence to call it an *Eruca*. See TAB. I. *Fig.* 6. 7. and 8.

XV. *Some further Account of the before-mention'd* Dudley Foſſil, *by the* Editor *of theſe* Tranſactions.

THE Rev. Dr. *Pocock*, F. R. S. was ſo obliging as to ſend ſeveral Specimens of this Foſſil to the *Preſident*; who put them into my Hands, and deſired me to draw up an Account of them to be annexed to the preceding Paper.

The firſt Specimen is a Maſs of Stone containing the Face and Eyes, with ſome Rudiments of Legs on the Sides; but the Back is intirely broken away. Another Specimen contains the Head only: A third, the Head, and Part of the Back, but greatly diſtorted. But the moſt beautiful and complete are the two which

which I cauſed to be drawn and engraven in TAB. I. at *Fig.* 9, 10, 11, 12.

At *Fig.* 9. is one of theſe Inſects completely extended at its whole Length; wherein it appears, that the Head is cover'd with a Shell or Cruſt conſiſting of three Parts; the middle Part is broad and round, *a.* which I ſhall therefore call the Noſe: The two ſide Pieces are of a triangular Form, *b. b.* in each of which is ſituate a large protuberant Eye, *c. c.* The anterior Part of the Whole is encompaſſed by a round Border, *d. d. d.* which looks like an upper Lip; tho' I do not take it to be ſo; but that the Mouth is ſituate lower down, as in the Crab-kind, and does not appear in any of the Specimens I have yet ſeen. On each Side the Crown of the Head, towards the back Part of it, are two ſmall Knobs, *e. e.* At *f. f.* in *Fig.* 10. appear ſome Traces of Feet, which ſeem to lie under the Belly: But, as the Belly, or under Side, was not diſtinct, not being cleared from its ſtony and earthy Matter, I could not diſcern any other Legs.

It is moſt likely the whole Back of this Creature was, when alive, cover'd with a Caſe, or undivided *Elytrum*, as is the *Scolopendra aquatica ſcutata*, deſcribed in theſe *Tranſactions*, *n.* 447. *p.* 150, and 153. by M. *Klein*, of *Dantzick*; and afterwards by the Rev. Mr. *Littleton Brown*, both worthy Members of this *Society*. M. *Klein* ſays, the Caſe was whole; and that he was forced to ſlit it open to ſhew the Back underneath; when it appears, that the Body was trilobated, as in *Fig.* 9. The Caſe, being very thin and tender, may probably have been bro-

ken

ken off at the Death of the Animal, before its being petrified.

Mr. *Brown* does not mention in his Inſect the Property of rolling itſelf up, which this certainly had; as appears by ſeveral of the Figures, as *Fig.* 3, 4, 5, 7, 11, and 12, which are intirely rolled up; and as is more particularly repreſented by *Fig* 11 and 12. in which it appears, that the Tail is turn'd up under the Belly quite to the Mouth; and at *Fig.* 8. the Creature ſeems but half-rolled up.

I have conſulted all the Books I could meet with, which give Figures of Inſects and cruſtaceous Animals in their natural and petrified States; and find none reſemb'e this *Dudley* Foſſil ſo near as M. *Klein*'s Inſect; therefore I ſhall, till we get more Information, call it, *Scolopendræ aquaticæ ſcutatæ affine animal petrifactum.*

XVI. *The Deſcription and Figures of a ſmall flat* ſpheroïdal Stone, *having Lines formed upon it*; *by* C. Mortimer, *M. D. & Secret. R. S.*

MR. *Peter Collinſon*, a very worthy Member of the *Royal Society*, produced, at a Meeting of that Body, on *Nov.* 8. 1750. a very curious ſpheroïdal Stone, about 4 Inches Diameter, of a Chocolate-colour, marked with 4 white Lines, about the Breadth of a Horſe-hair, encompaſſing the whole Stone, like the Meridians on a Globe; but, inſtead of croſſing one another in a Point, as *they* do, upon the Globe, theſe are connected by a ſhort tranſverſe Line; as is deſcribed above in *p.* 535 of this

this *Tranſaction*, and as may be diſtinctly ſeen in TAB. I. *Fig.* 1. at *C D*.

I lately received, by a Friend, from the Iſle of *Shepey* in *Kent*, a ſmall Stone, with ſimilar Lines upon it. Mine is only $\frac{7}{8}$ of an Inch in Diameter, of a brown Colour, and of the Conſiſtence of Marble. As a Deſcription in Words does not convey ſo clear an Idea as an exact Drawing, I have endeavoured to give Repreſentations of this Stone in different Views, as at TAB. I. *Fig.* 13, 14, 15, 16.

Fig. 13. repreſents the Top of the Stone, on which the Lines are moſt regular, being depreſſed into the Stone, and of the ſame Colour with it. *a*, *c*, *d*, *e*, are the four principal Lines, anſwering to thoſe on Mr. *Collinſon*'s Stone, and are connected, as in his, by the tranſverſe Line *g h*. The Line *b* is an Irregularity in this Stone, and ſo is *f*, which are not in the other; theſe irregular, or ſupernumerary Lines being continued to the other Hemiſphere,

Fig. 14. or Bottom of the Stone, make the Directions of the other Lines very irregular, as may be ſeen in the Figure; only the Lines *c*, *d*, and *e*, being connected by the tranſverſe Line *g h*, which here ſtands at right Angles with that in *Fig.* 13.

The following Figures repreſent the Section of the Stone thro' its Equator, as nearly as poſſible; only the Mill cut away the Subſtance to about the Thickneſs of a Shilling. In theſe Sections the Ramifications appear quite white.

Fig. 15. ſhews the Section of the upper Hemiſphere, as

Fig. 16. does that of the lower Hemiſphere; in both of which the Letters of Reference anſwer to thoſe in the other Figures, ſhewing where the outſide Lines abutt upon theſe Sections.

An Explanation of the Figures in TAB. I.

1. Mr. *Collinſon*'s ſpheroïdal Stone.
2. The Section of the ſame.
3. The Face of the *Dudley* Foſſil rolled up.
4. The Back of the ſame.
5. The fore and under Part, with the Tail folded cloſe under the Jaw.
6. Dr. *Shaw*'s Foſſil half-extended.
7. The Face of the ſame.
8. The under Side of the ſame, being folded but half-way, leaving a Space between the Jaw and the Tail.
9. Dr. *Pocock*'s extended Foſſil, the Back uppermoſt.
10. A ſide View of the ſame.
11. A ſide View of another folded up.
12. A front View of the ſame with the Tail folded cloſe under the Jaw.

The Letters of Reference in the Deſcription anſwer to the ſame Parts in *Fig.* 9, 10, 11, and 12.

13, 14, 15, 16, are the Figures of the Stone, deſcribed in *Art.* XVI. in all which the Letters refer to the ſame Lines.

TAB. II. Repreſents a large Maſs of Lime ſtone dug up at *Dudley*, in which are imbodied many of theſe Foſſils, together with ſeveral other petrified Shells.

NOTE.

NOTE.

To N. 491, p. 64, l. 1. *hence we are led to a Diſcovery, &c.* add this Note, *The* Diſcovery *of this* Analogy *was publiſhed by the Rev. Mr.* William Barlow, *in theſe* Tranſactions, N. 458, p. 457, *Anno* 1740. *C. M.*

ERRATA.

In N°. 495. *p.* 514, *l.* 2. for *with* read *within.* Ibid. *p.* 515, *l.* 24. for *Nonius* read *Catgut Line.*

Numb. 497.

PHILOSOPHICAL TRANSACTIONS.

BEING

An APPENDIX to those for the Year 1750.

Consisting of a Collection of several Papers laid before the *Royal Society*, concerning several *Earthquakes* felt in *England*, and some neighbouring Countries, in the Year 1750.

The CONTENTS.

I. *Mr.* H. Baker *F. R. S. to* Martin Folkes *Esq*; President *of the* Royal Society, *concerning the* Earthquake *felt at* London Feb. 8, 1749-50. *p.* 601

II. *An Account of the Shock of an* Earthquake, *felt* Feb. 8. 1749-50: *By* Gowin Knight *M. B. & F. R. S.* *p.* 603

III. *An Account of the same, by* Jo. Freeman *Esq*; *F. R. S.* *p.* 605

IV. *An Account of the same, by* Wm. Fauquier *Esq*; *F. R. S.* *ibid.*

V. *The Rev.* Henry Miles *D. D. F. R. S. to Mr.* H. Baker *F. R. S. on the same.* *p.* 607

VI Jo. Martyn *M. D. to the* Pres. *concerning the same.* *p.* 609

VII. *Extract of a Letter from Mr.* Trembley *F.R.S. to the* Pref. *concerning the ſame. p.* 610

VIII. Smart Lethieullier *Eſq*; *F. R. S. to the* Preſident, *of the burning of the Steeple of* Danbury *in* Eſſex, *by* Lightning, *and of the* Earthquake. *p.* 611

IX. *The* Preſident's *Account of the* Earthquake *at* London, March 8. *p.* 613

X. *An Account of the ſame, by the Rev. Mr.* Tho. Birch *F. R. S. p.* 615

XI. *Mr.* H. Baker *F. R. S. to* Martin Folkes *Eſq*; Pref. *of the* Royal Soc. *concerning the ſame. p.* 617

XII. *To Mr.* H. Baker *F. R. S. of extraordinary* Heat *in* Feb. *and of the ſame* Earthquake. *p.* 619

XIII. M. Clare *Eſq*; *F. R. S. to* C. Mortimer *M. D. & Secr. R. S. of the ſame. p.* 620

XIV. D. P. Layard *M. D. & F. R. S. to the* Preſident, *concerning the ſame. p.* 621

XV. *The Reverend Mr.* R. Pickering, *F. R. S. to the* Preſident, *concerning the ſame. p.* 622

XVI. *An Account of the Earthquake on* Thurſday *Morning*, March 8, 1749. *as ſeen in the* Inner Temple *Garden, by* Robert Shaw; *communicated by* James Burrow *Eſq*; *F.R.S. p.* 626

XVII.

XVII. *The Rev.* H. Miles *D. D. F. R. S. to Mr.* H. Baker *F. R. S. containing a more full Account of the ſame than his former Letter*, Art. XII. *p.* 628

XVIII. J. Martyn *M. D. F. R. S.* &c. *to the* Preſident, *concerning the ſame.* *p.* 630

XIX. Michael Ruſſel, *Eſq*; *F. R. S. to the* Preſident, *concerning the ſame.* *p.* 631

XX. James Parſons *M.D. F.R.S. to the* Preſident, *concerning the ſame.* *p.* 633

XXI. *An Account from* J. Burrow *Eſq*; *F.R.S. of what Mr.* Boyfield *told him concerning the late Earthquake.* *p.* 637

XXII. *Obſervations on the Earthquake*, March 8. 1749. *by* C. Mortimer, *M. D.* Secr. R. S. *p.* 638

XXIII. *The Rev.* H. Miles, *D. D. & F.R.S. to the* Preſident, *containing ſome additional* Obſervations *to his former Accounts.* *p.*639

XXIV. *The Rev.* W. Stukely *M.D. & F. R. S. to the* Preſident, *on the Cauſes of* Earthquakes. *p.* 641

XXV. *Extract of a Letter to Mr.* J. Ellicott *F.R.S. concerning an* Earthquake *at* Portſmouth, March 18. 1749-50. *p.* 646

XXVI. *Extract of a Letter from* Portſmouth; *communicated by* Daniel Wray *Eſq*; *F.R.S. concerning the ſame.* *p.* 647

XXVII. *The Rev.* W. Cooper, *D.D. Dean of* Durham, *to the* Preſident, *of the* Earthquake *on* March 8. *and of the* luminous Arch, February 16. 1749. *ibid.*

XXVIII. *Extract of a Letter from the Rev. Mr.* Taylor, *Vicar of* Portſmouth, *to Mr.* Roderick, *concerning an* Earthquake *felt there*, March 18. 1749-50. *p.* 649

XXIX. *Extract of a Letter from Mr.* Benj. Cooke *F. R. S. to Mr.* P. Collinſon *F.R.S. of a Shock of an* Earthquake *felt in the* Iſle *of* Wight, March 19. 1749-50. *p.* 651

XXX. *Extract of a Letter from a Gentleman at* Southampton *to* Joſiah Colebrooke, *Apothecary, F. R. S. of the Shocks felt in thoſe Parts*, March 18 *and* 19. 1749-50. *p.* 652

XXXI. *A Letter from Mr.* Peter Newcome *F. R. S. to the* Preſident, *concerning the ſame Shock being felt at* Hackney, *near* London. *p.* 653

XXXII. *A Letter from* James Burrow *Eſq*; *F. R. S. to* Peter Daval *Eſq*; Secr. R. S. *concerning the ſame* Earthquake *being felt at*

at East Sheen, *near* Richmond *Park in* Surrey. *p.* 655

XXXIII. *The Rev.* W. Stukely *M.D. F.R.S. to the* President, *concerning the Causes of* Earthquakes. *p.* 657

XXXIV. *Some Considerations on the Causes of* Earthquakes. *By the Rev.* Stephen Hales, *D. D.* and *F. R. S.* *p.* 669

XXXV. *The* President's *Report of the Account given him by* Tho. Burrat, *of* Kensington, *concerning the* Earthquake *on* March 8. *last past.* *p.* 681

XXXVI. *Extract of a Letter from* Chester, *concerning an* Earthquake *felt there* April 2. 1750. *communicated by* Robert Paul *Esq*; *F. R. S.* *p.* 683

XXXVII. *A Letter from the Rev.* Stephen Hales *D D. & F. R. S. to the* President, *serving to inclose a Letter to him from* W. Bowman *Esq*; *concerning an* Earthquake *felt at* East Molesey *in* Surry, *on* March 14. 1749-50. *p.* 684

XXXVIII. *Abstract of a Letter from Mr.* Pennant *to* Rich. Holford *Esq*; *Master in* Chancery, *of an* Earthquake *felt in* Flintshire, *on* April 2. 1750. *p.* 687

XXXIX.

XXXIX. *The Poſtſcript of a Letter from Mr.* Nath. Downe *to the Hon. Mr.* Greenville, *concerning an* Earthquake *felt at* Bridport, *on* March 18. 1749-50. *p.* 688

XL. *Mr.* H. Baker *F. R. S. to the* Preſident, *concerning an* Earthquake *felt at* Winbourn *in* Dorſetſhire, May 4. 1749. *and of another at* Taunton *in* Somerſetſhire, July 1. 1747. *p.* 689

XLI. *Part of a Letter from M.* de Reaumur *F. R. S. to the* Preſident, *concerning an* Earthquake *felt in* France, October 11. 1749. *p.* 691

XLII. *The Rev. Mr.* Wm. Barlow *to the* Pref. *concerning a Shock of an* Earthquake *felt at* Plymouth, *about One o' Clock in the Morning, between the 8th and 9th of* Feb. 1749-50. *p.* 692

XLIII. *A Letter from Mr.* Ph. Warburton *to the* Preſident, *ſerving to incloſe an Extract of a Letter from the Rev. Mr.* J. Seddon, *of* Warrington *in* Lancaſhire, *to Mr.* Jo. Philpot, *in* Cheſter, *concerning an* Earthquake, April 2. 1750. *p.* 695

XLIV. *Mr.* H. Baker *F.R.S. to the* Preſident, *containing an Extract of a Letter from Mr.* W. Arderon . *R. S. concerning an* Exploſion

Explosion *in the* Air, *heard at* Norwich, June 7. 1750. *p.* 698

XLV. *An Account of Part of a* Roof *of a* Pot-house *at* Lambeth *being flung down by the* Earthquake, March 8. 1749-50. *p.* 700

XLVI. *Extract of a Letter from Dr.* Mackenzie *to Dr.* Mead *F. R. S. concerning* Earthquakes *at* Smyrna. *ibid.*

XLVII. *Part of a Letter from* Wm. Folkes, *Esq*; *F. R. S. to his Brother the* Pres. *concerning a Shock of an* Earthquake *felt at* Newton *in* Northamptonshire, *on* Sunday, September 30. 1750. *p.* 701

XLVIII. *Part of a Letter from* J. Burrow, *Esq*; *F. R. S. to the* President, *concerning an* Earthquake *felt near* Bury St. Edmund's *in* Suffolk, *and another at* Narborough *in* Leicestershire, *on the* 30*th of* September, 1750. *p.* 702

XLIX. *A Letter from the Rev. Mr.* J. Nixon, *F. R. S. to Mr.* John Ward, *F. R. S. and* Rhet. Prof. Gresham. *serving to accompany two Letters*; *one from Sir* Thomas Cave, *Bart. and another from the Minister of* Weston with Sutton *in* Northamptonshire; *concerning the* Earthquake *on* Sept. 30. 1750. *p.* 705

L. *A Letter from the ſame to the* Pr. R. S. *containing further Particulars of the ſame* Earthquake. *p.* 710

LI. *A Letter from the Rev.* P. Doddridge *D. D. to Mr.* H. Baker *F R. S. containing ſome Account of the late* Earthquake *felt at* Northampton. *p.* 712

LII. *An Account of the* Earthquake *which happen'd* September 30. 1750. *by Mr.* —— *Steward to the Earl of* Cardigan. *p.* 721

LIII. *Extract of a Letter from Mr.* H. Green *to Mr.* J. Ayſchough, *Optician, relating to the* Earthquake *felt* Sept. 30. 1750. *p.* 723

LIV. *Extracts of Letters from* M. Johnſon, *Eſq*; *and from* J. Green *Eſq*; *to* Emanuel Mendez da Coſta, *Eſq*; *F. R. S. concerning an* Earthquake *felt* Aug. 23. 1750. *p* 725

LV. *Part of a Letter from the Rev.* H. Miles, *D. D. to Mr.* H. Baker, *concerning the* Earthquake *felt on* Sept. 30. 1750. *p.* 726

LVI. *A Letter from the Rev. Mr.* J. Nixon, *F. R. S. to the* Preſident; *and a Letter from Mr.* W. Smith *to Mr.* Nixon, *giving a very particular Account of the* Earthquake *felt on* Sept. 30. 1750. *p.* 727

LVII. *The* Philoſophy *of* Earthquakes; *by the Rev.* W. Stukeley, *M. D. F. R. S. in a Letter to the* Preſident. *p.* 731

I.

Mr. Henry Baker *F. R. S. to* Martin Folkes *Esq*; Preſident *of the* Royal Society, *concerning the* Earthquake *felt at* London Feb. 8, 1749-50.

Read Feb. 8, 1749-50.

AS I was walking along *Chancery-lane* To-day, towards *Holbourn*, about 40 Minutes paſt 12 o' Clock, People came out of ſeveral Houſes to their Doors in great Surprize, complaining of the ſhaking of their Houſes, and imputing it to the Fall of ſome great Timber, or other heavy Body, which they ſuppos'd at ſome little Diſtance from them, and which they came out to inquire after.

When I was got into *Holbourn*, I found the People under the ſame Conſternation, and expreſſing themſelves nearly in the ſame manner.

Going to *Gray's-Inn*, many People were got together in the great Square, talking about the Shock they had felt; and in particular a Lamp-lighter was giving an Account, that, being on his Ladder, pouring Oil into a Lamp, he was in Danger of falling off, by ſomebody's ſhaking the Ladder, as he at firſt imagined.

I then went to a Gentleman's Chambers under *Gray's Inn* Library, where I was told the Shaking had been ſo much, that they thought a Clock would have been thrown down; and imagin'd at the time, ſome large Box or Heap of Books had been tumbled down over Head.

The People in all the Streets, as I returned home, were talking of this Matter; and ſome of the Women complaining that the Motion had made them ſick.

My own Family, in *Catherine-ſtreet* in the *Strand*, had been no leſs ſurpriſed, and had ſent to the Neighbours to inquire if ſome heavy thing had fallen down, to occaſion the Shaking of the Houſe, which Mrs. *Baker* deſcribed as very great; She ſat in the Dining-Room, which is to the Street, and her Belief at the Inſtant was, that the Servant was fallen all along in the backward Room of the next Story higher, thereby ſhaking the Houſe, and making a conſiderable Noiſe.

My Son felt the ſame Shock at the *Tower*; where alſo a Gentleman, who was ſitting at a Table to write, in his Houſe in the Mint, was thrown out of his Chair with a conſiderable Force towards the Table; and where every Body was much ſhock'd with the Apprehenſion of ſome Exploſion of Gunpowder.

What therefore ſo many People, in different Streets, at great Diſtances from each other, have been ſurpriſed at, cannot be only Fancy, but muſt be owing to ſome real Cauſe; and if no Powder-Mill, or Magazine of Powder has been blown up, it muſt have been an Earthquake, or ſome Tremor of the Earth itſelf.

I was pretty curious to inquire of People in different Places, to judge the better from their ſeveral Reports; and I found them agree, almoſt in general, in the firſt Suppoſition of ſome weighty Body falling; moſt ſaid with a Noiſe, but ſome ſeemed uncertain as to that. I endeavour'd likewiſe to

learn

learn its Courſe, by comparing the Accounts of People in different Situations: It ſeems to have lain Eaſt and Weſt, and to have paſſed from the Weſt Eaſtward. I felt nothing of it myſelf as I walked the Street, nor do I find that many who were walking did.

I hope you will pleaſe to excuſe this haſty Account, and permit me to aſſure you that I am, with all poſſible Reſpect,

SIR,

Catherine-ſtreet, Feb. 8. 4h *p.m.* 1749-50.

Your moſt obedient humble Servant,

H. Baker.

II.

An Account of the Shock of an Earthquake, *felt* Feb. 8. 1749-50: *By* Gowin Knight *M. B. & F. R. S.*

Read Feb. 8. 1749-50.

TO-DAY, betwixt 12 and 1 o'Clock, the Houſe in which I live in *Lincoln's-Inn Fields* was ſhook violently for a Moment. The Room where I was ſhook very much, but nothing was thrown down. In another Room the Grate was ſeen to move, and the Fire-ſhovel was thrown down. A Maid-Servant that was above-ſtairs was much frighten'd with the Shock and Noiſe: She ſaid, ſhe heard a Sound like Thunder, which

ſeem'd to come from below: That the Window-curtains and Bed ſhook very ſenſibly, and the latter was moved from its Place nearer to the Wall. Three other Perſons in the Houſe both heard the Noiſe and felt the Shock; but I did not take notice of the Noiſe myſelf, being intent upon ſomething elſe at that time.

Soon after this happen'd, a Servant came from his Grace the Duke of *Newcaſtle*, to inquire if we had perceiv'd what had happen'd; and ſaid, that his Grace's Houſe had ſhook all over.

I ſent to two or three Houſes in the Neighbourhood, and was informed, that they were equally ſenſible both of the Shaking and the Noiſe; and at one of the Houſes it had thrown down a Firkin of Butter from a Shelf. I was further informed, that ſeveral of the neighbouring Inhabitants ran out of their Houſes; and ſome Gentlemen that were playing at Tennis ran out of the Tennis-Court.

A Woman reports, that ſhe felt a like Shock the Night before laſt about 7 o'Clock, which made the Candle jump off the Table at which ſhe then ſat.

Whilſt I was writing, a Man came in from *Greenwich*, who ſaid, he was at *Dockhead* when the Shock was felt there, and the Noiſe ſeem'd to him like that of a Cannon at a Diſtance: That all the Way he came, as far as *London-Bridge*, the People were alarmed at it.

III.

An Account of the ſame, by Jo. Freeman *Eſq; F. R. S.*

Read Feb. 8. 1749-50. AS I paſſed thro' the *Mews* To-day, a little before 1 o'Clock, I felt a Shock like an Earthquake, and I thought I heard a hollow deep Noiſe. Several Women thereabouts came running out of their Houſes much terrified.

At *Leiceſter-Houſe* they were apprehenſive the Foundation was giving Way, and were going to ſend immediately for the Surveyor.

All the Way in my Return home, I ſaw many Groups of People together, and diſcourſing upon this Shock that had juſt happen'd; ſome imagining it was occaſion'd by ſome Houſes being blown up in *Gold-Lane*, where there was a great Fire, and others from ſome Powder-Mills blowing up; the ſame thing having been obſerved about 9 Years ago, from the like Accident at the Mills at *Hounſlow*. If neither of theſe Cauſes appear, it can be no other than an Earthquake.

IV.

An Account of the ſame, by William Fauquier *Eſq; F. R. S.*

Read Feb. 15. 1749-50. ON *Thurſday* the 8th of *February*, 1749-50. at about half an Hour after 12, as I was ſitting reading with one Elbow on

on the Table, on the Ground-Floor, in my House at *Eltham* in *Kent*, I felt two Shocks from East to West, which I immediately thought was an Earthquake, as I had felt something like it once at *Naples*; and was confirm'd in my Opinion, by my Wife's running down-stairs frighted, and declar'd it was an Earthquake, she having felt one in the *West-Indies*. She was in the Room over me, in which Room there was China standing on a Cabinet, which, she says, shook in such a manner that she expected it to fall. My Children, who were in the Room over her, seem to have felt it stronger, as they say, they apprehended a Chest of Drawers in their Room was falling. The Servants that were in the Kitchen, which has no Room under it, seem to have felt but little of it. One that was writing says he felt the Dresser move, and the Wall, but thought it was only the Shutting of a Door. Other Servants in the same Room felt nothing at all of it. My Gardener, who was at Work in the Garden, felt nothing of it.

The Wind was at S. W. and had been high in the Night and Morning, but was very much abated; and after this, for some time, it was quite calm; which I believe it is generally observ'd to be, in those Countries where Earthquakes are more frequent. A Flight of Pigeons I have, seem'd to be much frighten'd.

Eltham is about 8 Miles S. S. E. from *London-Bridge*, and stands on a Hill.

This Account was written before I had heard any thing from *London*.

V.

The Rev. Henry Miles *D. D. F. R. S. to Mr.* H. Baker *F. R. S. on the ſame.*

Dear Sir,

Read Feb. 15. 1749-50. THO' I have not Time to anſwer your valuable Letter at preſent, permit me to return you my ſincere Thanks for it, and at the ſame time to give you the beſt Anſwer I can to that Part of it which does more immediately require it.

I find, upon Inquiry, that the Earthquake on *Thurſday* laſt was felt in a Gentleman's Houſe in this Place, pretty ſenſibly, in two Chambers, and in another over one of them, by a Tremor of the Wainſcot and Utenſils, and a ſmall Shock ſucceeding; but was not perceiv'd at the other End of the Houſe, in a Room on the ſame Story with the Chambers. I ſhould have thought, when it was felt ſo near us, as about 150 Yards, our Houſe, which I look upon as very ſuſceptible of Impreſſions, ſo as to be ſhaken by the Winds, would have been affected: But if it had, 'tis hardly poſſible but ſome of the Family muſt have perceiv'd it, conſidering the Parts they were in, and their being chiefly in a ſitting Poſture. I conclude therefore it could not be very conſiderable here. I have endeavour'd to learn whether it extended any further to the South of us, but cannot yet find it did.

The Wind has been chiefly S. and S. W. for ſome Months paſt, much longer than is uſual at any Time of the Year; and yet we have had but a ſmall Quantity

Quantity of Rain hereabout for the Seaſon. ——I give you, on the other Side, the State of the Barometer and Thermometer on the 8th, and two Days before and after that, as obſerved at *London* by my ingenious Friend Mr. *Canton*, and by myſelf here, at 2^h *p. m.* and at 8^h *p. m.* each Day. I ſhall only add, that Yeſterday (the 13th) my Thermometer abroad at 1^h *p. m.* was at 59 = to 27° above the freezing Point: A Degree of Warmth exceeding what we had ſeveral Days in laſt *June*, at 2^h *p. m.* I ſhall write you again the firſt Opportunity, and am,

Tooting, *Feb.* 14, 1749-50.

Your, and the Royal Society's,

moſt obedient Servant,

H. Miles.

At *London*.

Day.	At 2 *p. m.* Barom.	Thermom.	At 8 *p. m.* Barom.	Thermom.
6	29,14	48	29,27	43
7	29,90	48½	29,99	43
8	29,83	54	29,95	52
9	29,97	55½	29,96	52½
10	29,90	54	30,03	45½

At

At *Tooting*.

Day.	At 2 *p. m.* Barom.	Thermom.	At 8 *p. m.* Barom.	Thermom.
6	29,18	49	30,32	42
7	29,94	49	30,03	38½
8	29,88	55	29,98	52
9	30,—	56	29,99	52½
10	29,88	55½	30,04	45

VI.

Jo. Martyn *M. D. to the* Preſident, *concerning the ſame.*

SIR, *Chelſea, Feb.* 14, 1749-50.

Read Feb. 15. 1749-50.

SOME time ago I troubled you with ſome Account of an *Aurora Auſtralis*†, which I hope you receiv'd: I now take the Liberty to mention the Earthquake, which happen'd on *Thurſday* laſt, of which you have without doubt had many and better Accounts from other Places.

It was felt here at 40′ after Noon. All the Houſes were violently ſhaken, eſpecially thoſe which are neareſt to the River. I was ſitting in my Study, which fronts the S W up one Pair of Stairs. I imagin'd that ſomething heavy had fallen down in the Room below me. The Servants, who happen'd to be diſperſed in ſeveral Rooms, each of them thought one of the others had thrown down ſome heavy Cheſt or Cabinet. A Maid-Servant, who happen'd to be paſſing from one of the under Offices to another, felt the Ground ſhake under her. As the Place on which her Feet were was full 6 Feet below the

† See theſe *Tranſactions*, N. 494, *p.* 319.

Surface, I immediately concluded, that ſuch a Motion muſt be occaſion'd only by an Earthquake.

However, as moſt of the Neighbours were confident that the Shock was occaſion'd by the blowing up of the Powder-Mills at *Hounſlow*, I diſpatched a Meſſenger thither on Horſeback, who brought me Word, that the Shock was not felt either there or at *Brentford*; and that he could not learn that it had been felt farther Weſtward than *Kenſington*-Turnpike.

I have alſo ſince been inform'd, that it was felt at *Fulham*; but a Friend, who lives a little beyond *Richmond*, has ſent me Word, that they did not feel it there.

Of thoſe who were in the Street, or upon the River, ſome felt it, and others not.

I am credibly informed, that Letters from *Calais* and *Boulogne* mention its having been felt on that Coaſt.

It ſeems therefore to have extended itſelf far to the Eaſt; but to have terminated in the Weſt, about two Miles beyond this Place. I am, Sir, with the greateſt Reſpect,

Your moſt humble Servant,

J. Martyn.

VII.

Extract of a Letter from Mr. Trembley *F.R.S. to the* Preſident, *concerning the ſame.*

SIR, Harwich, Feb. 11. 1749-50.

Read Feb. 15. 1749-50. THE Earthquake was not felt at *Ingatſtone*, nor at *Colcheſter*, nor at this Town.

VII.

On *Thurſday* laſt the Lightning fell on 2 Steeples not far from *Colcheſter*. * * *. From

† *Your humble Servant,*

Abraham Trembley.

VIII.

Smart Lethieullier *Eſq*; *F. R. S. to the* Preſident, *of the burning of the Steeple of* Danbury *in* Eſſex, *by* Lightning, *and of the* Earthquake.

SIR,

Read March 1. 1749-50.

AS I think there was ſome Miſtake in the Account of the late burning of *Danbury* Steeple by Lightning (read laſt *Thurſday* before the *Royal Society*) which Miſtake ſeem'd to give Room to imagine it had ſome Connexion with the late Earthquake, I take the Liberty of ſending you the Particulars of the aforeſaid Accident, as they were tranſmitted to me by two Gentle-

† Mr. *Trembley*, who was going the next Day for *Holland*, was at the Time of the Earthquake with Mr. *Folkes* in his Study in *Queen's-Square*; where were alſo the Earl of *Macclesfield* and the Hon. *Charles Bentinck*; they all felt themſelves at the ſame Inſtant ſtrongly lifted up, and preſently ſet down again: They alſo heard a Noiſe over their Heads as of ſome heavy Piece of Furniture being thrown down, whilſt thoſe who were in the Room over them were frighted, and apprehended the like Accident had happened below-ſtairs. The Coachmen on the Boxes of 2 Coaches then ſtanding at the Door, were extremely ſenſible of the Shock, and apprehended the Houſe was going to fall upon them.

men of Diſtinction in the Pariſh, who are the preſent Church-wardens.

Monday, the 5th of this inſtant *February*, about 3 o' Clock in the Afternoon, a very great and black Cloud paſs'd over the Hill on which *Danbury* ſtands, and broke into a violent Storm of Thunder, Lightning, and Rain. No immediate Damage was apprehended that Night; but, between four and five o' Clock next Morning, ſome Perſons perceiv'd the Ball on the Top of the Spire (which was of Wood, and on which the Weather-cock ſtood) to be on Fire, they immediately alarm'd the Neighbourhood, and, by the Help of a large Fire-Engine, fetch'd from *Chelmsford*, they got the Maſtery of the Fire by about 11 o' Clock at Noon; tho' it broke out twice afterwards. It burnt downwards with great Fury, and has intirely conſum'd 11 Feet of the Spire, and damaged 8 Feet more, as likewiſe the Beams on which the Spire was fixed. ——— Some of the burnt Timbers and melted Lead have hurt the Roof of the Chancel, but not very conſiderably.

The great Height of the Situation of this Church probably expoſes it to Accidents of this Nature; for *Walſingham* relates, 'that, on *Corpus Chriſti* Day 'anno 1402. the Devil enter'd this Church in the 'Likeneſs of a Friar-Minor, where he raged, to the 'great Terror of the Pariſhioners, and at the ſame 'time, by the Violence of Thunder and a Tempeſt, 'the whole Body of the Church was broken.'

This Devil, or Friar, was, I conclude, no more than a Flaſh of ſome fiery Meteor, which the fruitful Fancy of thoſe Times could immediately cloath with the firſt Habit that occurr'd to them.

With

With regard to the Extent of the late Earthquake this Way (I mean due East from *London*) I cannot learn that it pass'd the little River *Rodden* that runs by my Gardens, and crosses the *Harwich* Road at *Great Ilford*. My own House stands about half a Mile North from the 6 Mile-Stone. I was in my Gardens with several Workmen, and none of us were sensible of any thing but my Wife, who was in her Dressing-room, felt the House tremble so much, that, upon my coming in, she told me she verily believ'd there had been an Earthquake; the Motion of the House under her being exactly like what she had often heard describ'd when she was in *Italy*. I am,

SIR,

Your most obedient humble Servant,

Aldersbrook, *Feb.* 27. 1749-50.

Smart Lethieullier.

IX.

The President's *Account of the* Earthquake *at* London, March 8.

March 8, 1749.

Read March 8. 1749-50. AT very nearly half an Hour after 5 this Morning, being then in Bed, but perfectly awake, I felt a very strong Shake, or rather 3 or 4 successive Shakes of an Earthquake, as I immediately took them to be. I judge the whole

Phænomenon

Phænomenon to have laſted about 3 or at moſt 4 Seconds of Time; and the Shocks appear'd to differ from what I had felt on the 8th of laſt Month, in this Particular, that I did not now perceive that lifting upwards, and ſudden ſettling again, which I was then ſenſible of; nor did I hear that diſtinct Noiſe, as of a great Weight falling, which moſt People were then ſurprized with: But what now moſt affected me was the Senſation of very quick Shakes, or of a *Tremor*, as it appear'd in a horizontal Direction; and I heard, during all the time, a ſort of Crackling of the Wainſcot, Window-Frames, and Floor, with ſuch a Rattling in the Chimney, as I have ſometimes heard upon a ſudden and ſtrong Guſt of Wind.

I inſtantly jump'd out of Bed, to ſee if there was any Damage done; and going to my Chamber-Door, I met my Daughter running in a Fright from her Room, who ſaid ſhe was wak'd with ſuch a Shock, that ſhe thought her Room had been falling; two Men-Servants alſo, who lay in the Garret, and whom I had called to, anſwer'd me whilſt I was talking to my Daughter, that they were both wakened by the Shock, and that they felt, as they both expreſſed it, ſuch a Motion, as they had ſometimes known given to a Child in a Cradle.

Preſently after I had got on my Clothes, I ſpoke to ſome of my Neighbours, who all gave me very nearly the ſame Account as this I have been juſt giving of what I had obſerved myſelf; only ſome added, particularly a Gentleman who lives in an older Houſe than mine, that he apprehended, from a crackling Noiſe over his Head, that a Chimney had been thrown

thrown down, and was then breaking thro' the Tiles and Lathing of his Houſe.

I ſent a Servant out about 7 o'Clock, and he met a Countryman, who was bringing a Load of Hay from beyond *Highgate*, and who was on the other Side of the Town when the Shock happen'd; he did not, he ſaid, feel it, as he was driving his Waggon; but that the People he ſaw in the Town of *Highgate* were all greatly ſurpriſed, ſaying they had had their Houſes very much ſhock'd, and that the Chairs in ſome were thrown about in their Rooms.

The Chamber I lie in is up two Pair of Stairs forwards, and my Bed ſtands North-Weſt and South-Eaſt. I took particular Notice, that there was neither Cart nor Coach going by, but that every thing was entirely quiet at the Time.

X.

An Account of the ſame, by the Rev. Mr. Tho. Birch *F. R. S.*

Read March 8. 1749-50.

THIS Morning, *Thurſday March* 8. 1749-50. about 18 Minutes before 6, according to equal Time, or half an Hour after 5 by the Sun, I felt, in my Bed-chamber, on the ſecond Story of my Houſe in *Norfolk* Street, adjoining to the River, a Shock of an Earthquake, much ſtronger, and of longer Duration, than that which I had felt on *Thurſday Feb.* 8. I was full awake, and had juſt begun to dreſs myſelf, when I was alarm'd with the trembling of the Room, attended with

with a Noiſe ſomewhat different from that of the former Shock this Day Month, which ſeem'd to be occaſion'd by ſome great Weight falling upon the Floor above me; whereas the Noiſe of this latter appear'd to me caus'd only by the tremulous Motion of the whole Room and the adjoining ones, the Walls, Wainſcot, Furniture, *&c.*

When I came down to my Study on the firſt Floor, I found a Book thrown down from an upper Shelf.

My Family were awaken'd by the Shock. The Air was at that time, and for ſome Hours after, extremely calm, and the Wind weſterly.

This Account was drawn up immediately before I had ſeen any other Perſon, except my own Family.

I have been ſince told by a Gentleman, who reſided many Years in the *Weſt Indies*, that this laſt Shock was more violent than any he had felt there, except one at *Carthagena*, in which a City, about 200 Leagues diſtant from thence, was ſwallow'd up at that Inſtant.

Another Gentleman deſcrib'd to me the Senſation, upon being awaken'd by the Motion, to be like that of falling into a Fit.

Tho. Birch.

XI.

XI.

Mr. Henry Baker *F. R. S. to* Martin Folkes, *Eſq*; Preſ. *of the* Royal Soc. *concerning the ſame.*

Read March 8. 1749-50.

ABOUT 40 Minutes after 5 o'Clock this Morning I was waked out of a ſound Sleep by a great Noiſe, hardly to be deſcrib'd, but what ſeem'd then to me as if the Roof of the Houſe was tumbling in, or like the rumbling I have ſometimes heard Thunder make before a very loud Clap. It continued 2 or 3 Seconds, as nearly as I could gueſs, under the Surprize of being awaked ſo ſuddenly; during which time the Windows rattled, the Tables, Chairs, and other Furniture in the Room, ſhook greatly; and a braſs Warming-pan, in particular, that ſtood upon a marble Slab before the Chimney, made a very remarkable ringing and jarring Noiſe.

Two Maids, in a Room over mine, were alſo wak'd by it, and got up immediately, being frighted by the ſhaking of the Bed on which they lay; but for my own part I felt little or no Motion of my own Bed. However, as moſt People who were in Bed agree in deſcribing ſuch a Motion, it was probably that which wak'd me, tho' the Violence of it might be over, before I was ſufficiently awake to take due notice of it.

My Son was likewiſe wak'd by the great rattling of the Windows in his Chamber, which he at firſt imagined to be ſhaken by a high Wind, they being apt to make ſome Noiſe in windy Weather, tho'

never like what he then heard, which ſeem'd like opening a Caſement-Window and ſhutting it again very ſuddenly and violently. A Cat that lay upon his Bed ſtarted up in much Surprize.

Several People in the Neighbourhood went out into the Streets, and others got upon the Leads of their Houſes, to ſee if any Damage was done. Some Milk-women felt it very ſtrongly as they were milking their Cows near *Maribone*. It was violent in *Bond-ſtreet*, and all that Quarter of the Town; and I find, by People living in very different and diſtant Parts of *London* and *Weſtminſter*, that it was felt univerſally through the Whole, and was not only longer in Continuance, but that its Motion was more violent and ſhocking than the Earthquake, which happen'd on *Feb.* 8. (this Day was four Weeks) a haſty Account of which I had the Honour to lay before you.

A Waterman that was lying in his Boat, then at Anchor near *Kingſton*, told a Friend of mine, that he was frighted with ſomething like a violent Blow ſtriking againſt the Bottom of the Boat; that the Water was much agitated, and that the Barges and other Veſſels upon the River were toſſed about as in a Tempeſt.

Theſe, Sir, are all the Particulars yet come to my Knowlege; which, tho' put together in a Hurry, may, I hope, prove acceptable. ——— I ſhall only add, that I have the Honour to be,

SIR,

Catherine-ſtreet, March 8. 1749-50. *Your moſt obedient humble Servant,*

Henry Baker.

XII.

To Mr. H. Baker *F. R. S. of extraordinary* Heat *in* Feb. *and of the ſame* Earthquake.

Dear Sir,

Read March 8. 1749 50. THE Temperature of the Air was found to be warmer by my Thermometer (abroad) ſeveral Days of the laſt Month at 2^h *p. m.* than I had obſerved it to be ſome Days in *June* laſt, at the ſame Hour; but, on *Thurſday Feb.* 22. at 2^h *p. m.* it ſtood at near 63; and ſoon after roſe to 63 full; which is higher, as appears from my Regiſter, than it was at the ſame Time of Day, 18 Days in the Month of *June*. And I find, by an Account ſent me from Mr. *Canton*, of *Spital-Square*, that his Thermometer was at the ſame Degree at 2^h *p. m.* the ſame Day.

This perhaps may be thought not unworthy to be regiſter'd in the meteorological Accounts in the *Phil. Tranſ.* but is ſubmitted to the Judgment of the *Royal Society*, by

Your and their moſt obedient,

Tooting, March 8. 1749-50.

humble Servant,

H. Miles.

P. S. I was this Morning, at 5^h 40′ ſurpriſed with a violent Shock in my Study, which ſhook the Doors of my Book-Preſſes exceedingly: It was felt all over this Town and the next. I have not Time for further Particulars, nor am I able to ſay as yet, whether it was cauſed by the blowing up of a Powder-Mill, or by an Earthquake.

XIII.

Martin Clare *Esq; F. R. S. to* C. Mortimer *M. D. & Secr. R. S. of the same.*

SIR,

Read March 8. 1749-50. AS I was walking this Morning in my Garden at *Kensington Gravel-Pits*, about 40 Minutes after 5 by my Watch, I felt an exceeding great Shock, a Succussion of the Earth, attended with an Explosion that, I fansy, resembled the blowing up of a Mine, and with the same kind of Noise. It was follow'd by a Trembling, very brisk at first, which gradually abated; and in about 3 Seconds, as near as I can judge, totally ceased. The Tremor was attended with the Noise of a distant Thunder, which, with the Motion, gradually died away.

I am not certain the Building near me moved; but I fansied it did. My Feet I am sure felt great Emotion; and a large Watering-pot, of 9 Inches Base, that stood near me, was thrown all along, the Moment the Trembling ceased.

This Communication I thought would be acceptable, from,

SIR,

March 8, 1749-50.

Your obedient humble Servant,

M. Clare.

P. S. I have since discover'd that my Watering-pot was overset by a Brick that was thrown off the House by the Shock.

XIV.

XIV.

Daniel Peter Layard *M. D. & F. R. S. to the* Preſident, *concerning the ſame.*

Read March 8. 1749-50.

NOtwithſtanding you will receive various Accounts, and many much better than I am able to ſend you; of the Earthquake felt this Morning, yet I with due Deference take the Liberty of laying before you the Particulars I obſerved, and ſuch as are come to my Knowlege.

At 40 Minutes paſt 5 this Morning, as I lay awake in a two Pair of Stairs Room, I heard a Noiſe, firſt as if the Top of the Houſe was cracking, and then as if it fell in. Inſtantaneouſly the Houſe ſhook with great Violence, rocking to and fro from N. E. to S. W. ſo as to make all the Furniture rattle, the Windows and Bells ring. It alſo waked all the Family, but the Servants in the Garrets felt the greater Shock.

It is reported, that two ſmall Shocks preceded this, one at 12 o' Clock laſt Night, the other at 2 this Morning; but I cannot ſay I felt either.

The Milk-People in the Fields were very ſenſible of this Earthquake, and ſay, that it began by a Report like that of a Cannon fired near at hand. Thoſe who were milking in a Barn thought it was coming down; but were not ſo ſenſible of the Earth's Motion as thoſe milking in the Fields, who could ſcarcely ſtand. The Cows were alſo frighten'd, and ran away from the People.

This Earthquake was univerſally felt at *Hampſtead*, and much ſtronger than that on the 8th of *February*.

I crave,

I crave, Sir, your Indulgence on this imperfect Account, and am, with all poſſible Reſpect,

SIR,

Dean-ſtreet Soho, March 8. 1749-50.

Your moſt humble, and moſt obedient Servant,

Daniel Peter Layard.

XV.

The Reverend Mr. Roger Pickering, *F. R. S. to the* Preſident, *concerning the ſame.*

Aldermanbury, March 8. 1749-50.

SIR,

Read March 8. 1749-50. THE Earthquake this Morning, which happen'd at ſo early an Hour as to ſurpriſe moſt People in their Sleep, I had all the Opportunities imaginable of obſerving to as much Exactneſs as *Phænomena* of this Nature can be; and therefore do myſelf the Honour to preſent you with this early Intelligence.

About a Quarter after 5 I was lying in Bed awake, and under the Compoſure which one generally feels upon recovering from a regular and refreſhing Sleep. To this the Serenity of the Morning greatly contributed, as well as the gradual Increaſe of Light, which, the Shutters being open, could eaſily be perceived thro' the linen Furniture of the Bed and Window-

Window-Curtains. I mention this Particular, becauſe, every Object in the Chamber being thus render'd ſufficiently diſtinct, I had the Opportunity of examining the Event by the Evidence of my Eyes, as well as that of my Ears. On a ſudden I heard a Sound like that of a Blaſt of Wind; ſuch a Blaſt I mean, as thoſe we perceive in the dry windy Days, ſo frequent with us about the Equinoxes; one that, at different Intervals, riſes gradually to its full Strength, and gradually dies off. The Attention this occaſion'd led me very ſenſibly to perceive myſelf rais'd in my Bed (which ſtood N. and S.) and to obſerve, that the Motion, as I lay upon my Back, began on my right Side, and from Head to Foot inclined me towards the left.

This was nearly inſtantaneous with the Commencement of the Blaſt, and I immediately concluded it to be an Attack of the ſame kind with that on this Day was a Month. The Senſation I felt at this time was rather ſolemn than terrifying; ſo that I patiently lay to obſerve the following Circumſtances.

The firſt Shock being given, the Motion that followed was that of a very quick Vibration; and looking at the Curtains of the Bed, I perceived their Motion was ſimilar. The Hinges of the Drawers of a Dreſſing-Table on my right Hand clapp'd, not only diſtinctly, but conſiderably loud; and a Sound, ſuitable to its Materials, came from every moveable Body in the Room. The whole Shock, to my Judgment, laſted about 10 or 12 Seconds of Time; when, the ruſhing Noiſe above-mention'd having gradually died away, every thing was reſtored to that Calmneſs which had preceded the Event.

I then

I then roſe, and found by my Watch that it was half an Hour paſt 5.

I am not able to judge of the comparative Force of this Shock with that on this Day Month; for I was then at my Houſe on *Enfield-Chace*, where it was not in the leaſt perceived, nor nearer to there (as I can learn) than *Edmonton*, which lies, in a S.E. Direction, about 3 Miles and a half nearer to Town. But one of my Chimnies in Town has ſuffer'd by this Shock; and I am informed that two others have been thrown down in *Monkwell Street* and *Jewin Street*, which lie in a N.W. Direction, from *Aldermanbury*, at about $\frac{1}{8}$ of a Mile Diſtance.

I think, Sir, I have ſomewhere found it obſerved by the antient Naturaliſts, that Earthquakes uſually, tho' not conſtantly, happen in the Spring and Autumn; and the Principle they go upon gives ſome Credit to their Obſervation. However, this induced me to look over my Minutes of ſuch Earthquakes with us as have come to my Knowlege ſince the Middle of the laſt Century. Theſe I found as follow; *viz.*

19 *Jan.* 1665 6 at *Oxford* - - about 6 Even.
17 *Sept.* 1683 at *ditto* - - about 7 Morn.
9 *Oct. ditto* thro' the Midl^d Counties about 11 Night.
8 *Sept.* 1692 { In *London*, and Parts adjacent, and in the *Engliſh* Camp in *Flanders* } about 2 *p. m.*
28 *Dec.* 1703 In the N. of *England* about 5 Even.
8 *February* 1749-50. { In *London*, and about 7 Miles round, & from private Hands at *Calais* } about 12½ *p.m.*

8 *March*

8 *March*, ditto { In *London*, where else, at present unknown, } about 5½ Morn.

Out of these seven Instances, you will perceive, Sir, that 3 have happen'd in the Autumn, 2 in Spring, and 2 in *December* and *January*; so that the Balance in Favour of the ancient Observations is as 5 to 2. I beg Leave also to observe, that of these, the 2 in the Spring are those we have so lately felt, and those, after the openest Winter, and in the warmest Spring, that our Country, possibly, ever knew. How far this Observation may be applicable to adjust the Cause of the two late Earthquakes, it would be impertinent in me, to offer to you.

You will please, however, to excuse me, Sir, if I take the Liberty of my Function to observe, that, however obvious, in general, the secondary Causes of these *Phænomena* may be; there is something so peculiarly affecting, so striking, in these solemn Struggles of Nature, as irresistibly suggests to the Mind the unspeakable Grandeur and Majesty of God, and arises in full Evidence of the Existence, Wisdom, and Power, of the LORD of NATURE.

It is, Sir, with very great Esteem that I take the Honour of being,

SIR,

Your most obedient humble Servant,

R. Pickering.

XVI.

An Account of the Earthquake on Thurſday *Morning*, March 8, 1749. *as ſeen in the* Inner Temple *Garden, by* Robert Shaw (*a very ſenſible* Scotchman) *then at Work there; communicated by* James Burrow *Eſq; F. R. S.*

Read March 15. 1749. HE was juſt come into the Garden (at half an Hour after 5), and was ſcarce arrived at the great Tree, neat the little Door under *Harcourt*'s Buildings (which is about 10 or 12 Yards perhaps diſtant from *Harcourt*'s Buildings), when he heard a GREAT NOISE, LOUDER BY MUCH than the Noiſe of the Exploſions upon the Proof of the *Great Cannon* at *Woolwich*, when full-charged (at which Proofs he has been often preſent); nay *louder, he thought, than* ANY *Noiſe he ever heard.* This Noiſe ſeemed to come from behind the Buildings; and his Face was then oppoſite to them.

At the ſame Inſtant he ſaw the whole Building *move upwards*, then *incline forwards* towards him (ſo that he thought it would fall upon him); then *recline backwards*, and then *ſettle*; at which time all the *Windows rattled and clatter'd*, as upon an Exploſion of a Cannon; the Sound in the Interim *rolling away* (ſeemingly from the Water-ſide up towards *Temple-Bar*) juſt like the rolling Sound or Echo which accompanies or ſucceeds the Exploſion of Thunder, or of Ship Guns.

As

As to the Continuance, he often expreſſed himſelf that it was *as a Thought*; and, in point of Time, he ſuppoſed it could not be 3 Seconds.

The Sound and the Motion began both together; but the Sound was quite rolled off, rather *ſooner* than the Buildings were ſettled.

I asked him how much he judged the Declination of the Building to have been *from the Perpendicular?* He anſwer'd, "That it was impoſſible to be "exact in relating that Particular, both by reaſon of "the Surpriſe he was in, and alſo from the Sud-"denneſs of the whole Compaſs of the Appearance, "which was but as a Thought." However, in order to form ſome Notion of it, I made a comparative Inclination of the Garden Key, which I held perpendicular to my Hand, and moved backwards and forwards, till he ſhould judge it to approach neareſt to what he could recollect of the Reeling of the Buildings (which indeed was but an inaccurate Method of coming at the Truth of a Thing profeſſedly uncertain even to the Relator): It ſeemed to me, by his Deſcription in this rough Compariſon (in which I might eaſily miſtake him) to be a Declination of ſeveral Degrees from the Perpendicular; which is alſo agreeable to his Apprehenſion, that the Building would fall upon him. Poſſibly, his Surprize might magnify the Appearance far beyond the Reality.

I then inquired what Perception he had of his own *perſonal Motion*, and that of the particular Spot of *Ground whereon he then ſtood?* He ſaid, his Surprize was ſo great, on ſeeing ſo new and uncommon an Appearance (for he was not in or near

London when the laſt Earthquake happen'd), that he either had *no Perception* at all concerning himſelf and the Ground under him; or at leaſt was ſo intirely engaged in obſerving what he ſaw and heard, that he had no Attention to what he felt.

N. B. I made this Memorandum immediately after after converſing with this *Robert Shaw*; and therefore I ſuppoſe it contains a tolerably exact Account of what he related to me.

Friday Morning, March 9. 1749. James Burrow.

XVII.

The Rev. H. Miles *D. D. F. R. S. to Mr.* H. Baker *F. R. S. containing a more full Account of the ſame than his former Letter*, Art. XII.

Read March 15. 1749. I NOW ſend you the beſt Account I am able of the Earthquake which was ſo generally felt in the City, and round about it, on the 8th inſtant in the Morning at 5^h 40′ nearly, equal time.

I was then ſtanding in my Study, when I heard a Noiſe, at the firſt Moment, very like the Exploſion I heard ſeveral Years ago, when ſome drying and Storehouſes of Gunpowder were blown up about 6 Miles from us: This Noiſe iſſued in a Murmur in the Air, like diſtant Thunder, and ended like a ruſhing Wind: There was no perceivable Intermiſſion in

in the Noiſe from firſt to laſt; it ſeemed to come from the Weſt, and continued about 4′ excluſive of the Tremor, which laſted ſome time after the Noiſe ſeemed to have ceaſed. I found no Motion of the Floor, which is over a Cellar, upon a Level with other adjoining Ground-floors; but the Doors of my Book-Preſſes, at the Weſt End of the Room, ſhook took to and again, and the Rings on the Doors rattled exceedingly; but I was not ſenſible of any Motion of the other Doors on the Sides of the Room, near to ſome of which I then ſtood.—— Such of the Family as were in Bed felt their Beds to be raiſed up, and then ſhook from Side to Side.

A ſenſible young Gentleman, who call'd upon me that Morning as he came from *London*, told me, that, conſidering the Situation his Bed was placed in, and the Motion he felt from one Side to another, he coucluded the Shock proceeded from the Weſt. The ſame Obſervation, he ſaid, others had made, with whom he had talked.

It was univerſally felt here, and very much at the following Places around us: At *Merton*, about a Mile S. W. from us, and at *Mitcham*, about 2 Miles S. at *Croydon* 4 Miles S. ſome Tiles fell from Houſes; it greatly alarmed the Inhabitants of *Streatham*, about a Mile and a half Eaſt of us; at *Clapham*, two Miles and a half N. a Chimney, and other Parts of a Building fell down; at *Wandſworth*, two Miles N. W. the Shock was very great; eſpecially near the Side of the *Thames*. It was felt likewiſe at *Epſom*, about nine Miles S. W. from us; but how much farther, my Information does not ſay.

Upon

Upon Inquiry made of ſeveral Perſons, who were abroad at the time, going to their Work, I cannot hear of any one, who ſaw any Lightning, perceiv'd any Noiſe, or felt any thing of an Earthquake.

The States of the Barometer and Thermometer were not remarkably different from what they had been for ſeveral preceding Days; however I have added them underneath, and am

Tooting, March 14. 1749. *Your, and the* Royal Society's *moſt obedient Servant,*

H. Miles.

7 Day at 4^h *a. m.* Bar. 30,07. Therm. 32 almoſt, W. W. clear, and white Froſt.
D^o at 9^h *p. m.* Bar. 29,99. Therm. 40, clear Evening.
8 Day at 4^h *a. m.* Bar. 30,07. Therm. 40, cloudy Morning. W. W.
D^o at 2^h *p. m.* Bar. 30,14. Therm. 58, cloudy Evening. W. W.

XVIII.

John Martyn *M. D. F. R. S.* &c. *to the* Preſident, *concerning the ſame.*

SIR, *Chelſea, March* 14. 1749.

Read March 15. 1749. I ONCE more trouble you with the Mention of an Earthquake, which was felt here on *Thurſday* the 8th inſtant, at about half

half an Hour after 5 in the Morning. It was much ſtronger than that which happen'd in *February*; two great Shocks being felt preſently after each other. Thoſe who were out of Doors felt the Ground ſhake under them very ſenſibly; whereas, in the former, few were ſenſible of the Shock, except thoſe who were in Houſes. I do not hear of any Miſchief done by it in this Neighbourhood; neither can I learn that it extended farther Weſtward than the former. I am very well aſſured, that it was ſtrongly felt at *Fulham*, and at *Turnham-Green*.

Several were ſenſible of a ſmaller Shock about 3 the ſame Morning; and ſome talk of unuſual Appearances in the Air. But this laſt Circumſtance ſeems not very well atteſted. For my own part, I look'd out of my Chamber-Window to the S. W. at a Quarter after 5, and only perceived it to be a grey Morning, ſuch as uſually predicts a fine Day. I am, Sir, with the greateſt Reſpect,

Your moſt humble Servant,

John Martyn.

XIX.

Michael Ruſſel, *Eſq*; *F. R. S. to the* Preſident, *concerning the ſame.*

Honoured Sir, *Hartſtreet, March* 14. 1749.

Read March 15. 1749. AS there happen'd ſome particular Circumſtances in the laſt violent Shock of an Earthquake, that were not taken notice

tice of at our laſt Meeting, I preſume therefore to ſend you the Obſervations I made thereon, as they appeared to me at my Houſe in *Bloomsbury*.

On *Thurſday* Morning laſt, about half an Hour after 5 o' Clock in the Morning, I was awaken'd by a violent Percuſſion of my Bed; the Shocks, I apprehend, laſted about 10 or 12 Seconds of a Minute; becauſe my Bed was rock'd from one Side to the other ſeveral times. The Motion appeared to me to be in a horizontal Direction. I heard no Noiſe before the Shake; but if any, it might perhaps occaſion my being ſo thoroughly awaken'd. My Servants told me they heard a Report like a great Blaſt of Wind with a Clattering and Snapping of the Windows and Doors of the Houſe, as they expreſſed it.

In my Dining-Room there was an *India* Cabinet, on which was placed ſome ornamental *China*, Part of which was thrown down on the Floor, and ſome broke.

But what, Sir, was moſt remarkable, I had two *China* Figures placed on the Cabinet, with their Faces fronting the Weſt, which were, by the ſeveral Shocks, turned about facing the N. E. which I took to be nearly one Third of the Circumference of a Circle. In this Situation I found them as ſoon as ſoon as I aroſe in the Morning; and I am aſſured nobody had been in the Room before to diſplace them.

Since, I was told by ſome Company, that were at my Houſe, that a Porter was going down *Chancery-Lane* to call a Gentleman to go to the *Brentford* Election, and, in his Way, as he called it, was ſtruck with a Blaſt

Blaſt, turned round on his Heel, and fell down, and has not been well ſince. Alſo another Perſon, that was ſet out on ſome Buſineſs, was nearly turn'd round by the Shock; which ſeems a little to confirm the moving the *China* Figures in the Direction before-mention'd.

If theſe Hints are worthy of your Notice, or to be communicated to the Learned Body of the *Royal Society*, they are at your Service. I am, with great Eſteem,

SIR,

Your moſt obedient humble Servant,

Mich. Ruſſel.

XX.

James Parſons *M.D. F.R.S. to the* Preſident, *concerning the ſame.*

SIR,

Read March 15. 1749. GIVE me Leave, among others, to communicate ſuch Facts as I know, or have been informed of, concerning the Shock that happened laſt *Thurſday*.

Between 5 and 6 in the Morning I was awaked by a violent Motion of the Houſe, with a great Noiſe reſembling the Fall of ſome heavy Body overhead: At waking I found my Bed move very much; but in my Surprize could not diſtinguiſh what kind of Motion it might be, as to its Direction; this

being momentary, as well as my Surprize, I ſaw and heard the *China* rattle upon a Cabinet in my Chamber, and perceived a trembling Motion in the Room for ſeveral Seconds. My Wife was alſo diſturbed; and asking what was the Matter, I ſaid I felt a Shock, which I believ'd to be like what had happen'd that Day Month: She anſwer'd, if this is one, I felt another about 2 this Morning, while you ſlept. I immediately look'd at my Watch, and ſaw it was ſix or ſeven-and-thirty Minutes after 5. I obſerved a Light ſhine in at my Windows more than was natural; and from the Redneſs of the Sky, and Clearneſs of the Morning, concluded the Sun was riſing; but imagin'd it ſomething ſtrange it ſhould riſe ſo many Minutes ſooner than was uſual upon the 8th of *March:* upon which I roſe, and went to my Window, which looked Eaſtward, and then ſaw it was a red Light only, extended from about N. N. E. to S. E. which I take to be that mention'd by the Rev. Dr. *Miles* laſt *Thurſday*.

Then I went into the Square, where ſeveral Servants came out of their Houſes much frighted. They all felt it the ſame Way; and ſeveral Labourers and Market People told me they were ſhaken very much as they walked, and that all *Newgate-Market* was in the greateſt Confuſion imaginable, no one thinking himſelf ſafe. The greateſt Part of thoſe I ſpoke to about it heard the ſame Sort of Noiſe that occurr'd to me at the time.

Many complained all Day of great Sickneſs at the Stomach, and *Head-aches*; I had the latter three or four Hours after it; and others of my Acquaintance

Acquaintance felt Pains in the Back the greateſt Part of that Day.

At *Mary'-bon* it was univerſally felt; and with the greateſt Violence imaginable. At one Houſe where I was at 12 that Day, a Maid-Servant ſaid, ſhe was thrown firſt to one Side, and then back to the other; and many compared it to the Rocking of a Cradle. I inquired particularly of ſuch as were thus rocked, about the Situation of their Beds, and obſerved, that, tho' all deſcribed the Motion to be from Side to Side, their Beds were in all Directions.

As to the Shock which was ſaid to be felt at two the ſame Morning, there can be no Doubt of it; for I went to ſeveral Families in my Neighbourhood, who poſitively aſſerted it to be true; but all ſaid it was not ſo ſtrong as that which happened afterwards; nor could any one ſay he was awaked by it: On the contrary, all thoſe, who felt it, ſaid they were awake before it happen'd. As for myſelf, I did not perceive it, being aſleep; and therefore I ſhould be inclined to think the Motion to be inſufficient to diſturb a ſleeping Perſon; for I am eaſily diſturb'd.

There is a ſtrong Report of a trembling Motion being felt at two on *Friday* Morning following, which laſted not long, and another at four the ſame Morning which laſted ſeveral Minutes, without any Noiſe. I met Counſellor *William Swinburn*, of *Devonſhire-ſtreet*, who told me, that Mr. *Love*, an eminent Apothecary at *Weſtminſter*, declared to him, that he had Occaſion to be up that Night, and was very ſenſible of thoſe trembling Motions both times; and I have been ſince inform'd, that one Mrs. *Marſhal* of *Queen's-Square* felt the Motion

about two that Morning, but was not ſenſible of the other.

I alſo made ſome Inquiries concerning the Extent of the Shock of *Thurſday* Morning, and was inform'd by *John Wolffe* Eſq; a great Studier of Nature, that he wrote to his Gardener at his Houſe at *Haſely-Court* near *Tedford* in *Oxfordſhire* about it, with Orders to go to *Henley* upon *Thames*, and inquire whether it was felt there, and he wrote back Word, that the Market-People who came there from twenty Miles round knew nothing of it. I was alſo informed by Mr. *Sherwood* of this *Society*, that it was not felt at *Horn-Church*, a Gentleman having ſent his Servant on purpoſe to know; nor any further that Way than *Ilford*. It was alſo felt at *Stanmore*, but not at *Watford*, five Miles further.

I was Yeſterday in the City, and a Gentleman ſaid, the Fiſh in his Ponds were remarkably diſturbed by the Shock, and that many of them leaped quite out of the Water upon the Bank; and while he was relating this, another came in, who ſaid, the ſame happen'd in a Pond of his, and in that of another Gentleman in his Neighbourhood at the ſame time. I am, Sir, with great Reſpect,

Thurſday, March 15. 1749-50. *Your moſt humble Servant,*

J. Parſons.

XXI.

XXI.

An Account from James Burrow *Esq; F.R.S. of what Mr.* Boyfield *told him concerning the late Earthquake.*

Friday, March 16, 1749.

Read March 22. 1749. MR. *Josiah Boyfield*, of *Gravel-Lane*, near *St. George's Fields*, *Southwark*, told me, that at the Time of the Earthquake, on *Thursday* Morning the 8th instant, he was not far from his Canal, and that it was a clear still Morning; the Air (as he expressed it) as clear as a Bell, with not a Breath of Wind stirring. As clear as a Bell, except that small Haziness which there almost always is in the Morning-Air.

He heard, he said, a great Noise like Thunder; which he at first took to be the Report of Ship-Guns; and immediately after the Ground shook and trembled under him, and he heard his Men say, *Look at the Fish.* The Sound came from the South-East, and moved to the West or North-West, over *Westminster:* It went off rattling like ten thousand Cannon; and he thought that *Westminster-Abbey*, and all that Part of the Town was coming down. The Sound preceded the Motion, and was ended before the Motion ceased.

He went, he says, nearer to the Canal, and saw the Water much disturbed; but he did not himself actually see the Fish leap out of the Water: However, some of his Men, whose Account he can depend upon, saw several Roach leap up, and saw the Fish in

in general ſhoot away in all Sorts of Directions, and ſeem to ſhift for themſelves, as if they were frighted and alarmed at what had happened.

XXII.

Obſervations on the Earthquake, March 8. 1749. *by* C. Mortimer, *M.D.* Secr. R. S.

Devonſhire-ſtreet, near Queen's-Square.

Read March 22. 1750.

ON *Thurſday* Morning, *March* 8. 1749. I awaked a little after Five; I open'd my Curtains, and obſerved the Sky hazy: I drank a Draught of Water, and, looking, on my Watch, found it to be but half an Hour paſt 5; and therefore was going to lie down again in my Bed; when, leaning upon my right Elbow, I firſt felt a Shock, as if the whole Houſe was violently puſhed from the N W to the S E and then, with equal Force, puſhed back again from S E to N W between which Shocks I heard a dull Noiſe; as if ſomething heavy, but ſoft, rolled to-and-fro' in the Garret over my Head. I ſaw the Cornice and Ceiling of the Room ſenſibly move, and then perceived a third and fourth Shock, ſo ſlow as to give me Time to reflect what might be the Event; and then a fifth and ſixth, which I own began to frighten me; the Strokes ſeeming to be exceeding ſtrong; not at all like a quaking or tremulous Motion, but like a forcible Shoving backwards and forwards; much reſembling the Rocking of a Coach, when croſſing the Rutts, or giving Way to another Carriage. My Son, who lay in the next Room called out in themidſt of it to know

what was the Matter? ſaying, the Wainſcot Partition between the 2 Rooms ſeem'd as if rending aſunder. The Whole ſeem'd to have laſted about 3 Seconds. I find that a Poſt, which ſupports the above-mentioned Partition cloſe to the Door-caſe, has given way a little; the Paint being freſh-crack'd; and a Crack in a Wall upon the Stairs is grown ſomething wider. The Door between the two Rooms, which ſhuts with a Fall-Latch, that was unlatch'd by the firſt Earthquake, and flapp'd to and fro' three or four times, was not unlatch'd by this laſt; which I think is an Argument, that by the firſt the Houſe was lifted up, and that it was not ſo by the laſt, but only rock'd from Side to Side.

I am credibly informed of a Pannel of Wainſcot in the City being wrenched out of the Groove, and not returning into it again.

XXIII.

The Rev. H. Miles, *D. D. & F.R.S. to the* Preſident, *containing ſome additional* Obſervations *to his former Accounts* *.

SIR,

Read March 22. 1750. IT having been commonly reported, that there was much Lightning on the Morning, and about the Time when the Earthquake happened on the 8th of this Inſtant, I was induced to get what Information I could of the Truth of it, in this Neighbourhood. If you ſhall jndge

* See this *Tranſ. p.* 619 *and* 629.

judge the Reſult of my Inquiry may be ſatisfactory to any of this honourable *Society*, I ſubmit it to be communicated; and am

Tooting, March 22, 1749-50.

Your and the Royal Society's *moſt obedient and moſt humble Servant,*

H. Miles.

A PERSON who went into an open Cart at 4 o' Clock that Morning at *Mitcham*, for *London*, ſaw no Appearance of Lightning at all. Several other Perſons, who were abroad, going to Work, ſome time before the Earthquake happen'd, declare that they ſaw none; nor were they ſenſible of any Noiſe, or Motion in the Earth.

I got Inquiry to be made of the Watchmen, who belong to the Callico-Printers, and watch all Night in the Grounds, and received this Anſwer from one, that he neither ſaw any Lightning, nor heard any Noiſe, and had no Perception of an Earthquake; and from another, who watched in other Grounds, a Mile or more diſtant from the firſt-mention'd, that he ſaw no Lightning all that Night; but ſays, that he heard an unuſual Noiſe about the Time in which the Earthquake is ſaid to have happen'd; but this it ſeems was not ſo remarkable as to have cauſed him to take notice of it to any one, had he not afterwards been told there was an Earthquake.

I have

I have, beſides this, made Inquiry of various Perſons, and cannot meet with one, who did ſee any Lightning, or who heard others ſay that they had ſeen it.

P. S. I am credibly informed, that a Gentleman's Servant at *Wandſworth* was watering his Maſter's Horſe by the River-Side, at the time when the Earthquake happened, who found the Water ſo much agitated on a ſudden, that the Horſe ſtarted back, and would not drink.

XXIV.

The Rev. W. Stukely *M. D. & F. R. S. to the* Preſident, *on the Cauſes of* Earthquakes*.

Read March 22. 1749. WHEN ſo great and unuſual a *Phænomenon* as an *Earthquake*, and *that* repeated, happens among us, it will naturally excite a ſerious Reflection in every one that is capable of thinking; and we cannot help conſidering it in a philoſophical as well as religious View. Any Mind will take the Alarm, when we perceive a Motion that affects the Earth, that bears the whole City of *London*, and ſome Miles round; and at the ſame time, whilſt it gives us ſo ſenſible a Shake, ſo gently ſets us down again, without Damage to any Buildings, and without a Life loſt.

In the Works of Nature and Providence there are no Degrees of *Great* and *Little:* Compariſons are incompatible; nevertheleſs we ourſelves are

* This Paper is publiſhed ſeparately by the Author, in a Pamphlet, at *London*, 1750. in 8*vo*.

more affected with what ſeems great, in our own Apprehenſions; but an OMNIPOTENT POWER admits of no Diſtinctions; and whilſt prodigious Effects are produc'd from Cauſes imperceptible, it rightly claims our ſerious Attention, as well as Wonder; nor need we loſe Sight of the theological Purpoſe of theſe amazing Alarms, whilſt we endeavour to find out the Philoſophy of them.

Permit me, then, to throw in my Thoughts on the Cauſe of Earthquakes. I did not enter into the common Notion of Struggles between ſubterraneous Winds, or Fires, Vapours, or Waters, that heav'd up the Ground, like animal Convulſions; but I always thought it was an electrical Shock, exactly of the ſame Nature as thoſe, now become very familiar, in electrical Experiments.

When we reflect on the unuſual Winter now paſt, beyond what occurs to any one's Memory, that it has been dry and warm to an extraordinary Degree, the Wind generally South and South-Weſt, and *that* without Rain, we may, with much Reaſon imagine, that the Earth has been in a State of Electricity, ready for that particular Vibration wherein Electricity conſiſts.

And that it has been ſo, we may further conclude from the extraordinary Forwardneſs of Vegetation, from the Frequency of the Northern Lights, and eſpecially of that called *Aurora auſtralis*, which are with us infrequent, and twice repeated, juſt before the Earthquakes (being of ſuch Colours as we had never ſeen before), and removed Southward, quite contrary to thoſe common with us.

Add

Add to this, that ſome Foreigners among us, from *Italy*, and thoſe Parts, where Earthquakes are frequent, obſerving theſe Lights, and the particular Temper of the Air, did actually foreſee the Event of an Earthquake. All theſe Matters concur, in ſhewing, that the Earth was in a State of Electricity, beyond what has ever been in our Memory.

Admitting this, there is nothing wanting, to produce the wonderful Effect of an Earthquake, but the Touch of any non-electric Body; and that muſt neceſſarily be had *ab extra*, from the Region of the Air, or Atmoſphere.

We had lately a very pretty Diſcourſe read here, from Mr. *Franklyn* of *Philadelphia* *, concerning Thunderguſts, Lights, and like Meteors. He well ſolves them by the Touch of Clouds, rais'd from the Sea (which are Non-electrics), and of Clouds rais'd from Exhalations of the Land (which are electrify'd): That little Snap, which we hear, in our electrical Experiments, when produc'd by a thouſand Miles Compaſs of Clouds, and *that* re-echoed from Cloud to Cloud, the Extent of the Firmament, makes that Thunder, which affrightens us.

From the ſame Principle I infer, that, if a non-electric Cloud diſcharges its Contents, upon any Part of the Earth, when in a high-electrify'd State, an Earthquake muſt neceſſarily enſue. As a Shock of the electric Tube in the human Body, ſo the Shock of many Miles Compaſs of ſolid Earth, muſt needs be an Earthquake; and that Snap, from the Contact, be the horrible uncouth Noiſe thereof.

* Read *Nov.* 16, 1749. publiſh'd with other Tracts on Electricity, by Mr. *Peter Collinſon F. R. S. London* 1750. 8*vo.*

I have been informed, by thoſe who were up, and abroad, the preceding Night, and early in the Morning, that Coruſcations in the Air were extremely frequent (which confirms us in the Notion of the Earth's being then in an electrify'd State); and that, a little before the Earthquake, a large and black Cloud ſuddenly cover'd the Hemiſphere; which probably occaſion'd the Shock, by Diſcharge of a Shower.

It may be ſaid, That, if this were the Caſe, Earthquakes would happen much oftener than we find them. It may be anſwer'd, That they probably do, much oftener than obſerv'd: But *ſlight* ones; becauſe of the Earth's being *ſlightly* electrified. And ſuch a Winter as this has not been known before; to which we attribute the preſent Earthquake.

The Reaſon is obvious, why Earthquakes are not ſo frequent with us, and the Northern Regions in general, as in *Italy*, and more Southern Climes; and a due Conſideration of it confirms our Reaſoning. All Electricity requires great *Dryneſs* and *Warmth*; and I doubt not but Earthquakes, of a ſmall Degree, have and do frequently happen. And many People now recollect, that they have been ſhaken in their Beds; tho' they took no notice of it then, having had no Experience of an Earthquake.

All that we have ſaid upon the Subject receives great Strength from *this* Particular, That Water ſtrengthens and conveys the Force of Electricity. From whence we may account for that Obſervation, that the moſt dreadful Effects of Earthquakes are always felt in maritime Towns; as *Port-Royal* in

in *Jamaica*, *Lima* in *Peru*, *Meſſina* in *Sicily*, *&c.* And *here*, we find plainly, that the Shock went along the River, both upwards and downwards, farther than by Land; like the Bottle of Water held in the Hand, in electrical Experiments.

We argue the ſame from the Sickneſſes, Pains in the Joints and Back, rheumatic, hyſteric, nervous Caſes, Head-ach, Colics, and the like; which many People, eſpecially of the weaker Conſtitutions, felt, for more than one Day after: Juſt as after Electrification.

But from hence it is highly worthy of Remark, that the Finger of PROVIDENCE is notoriouſly diſcernible herein;

——— *of* HIM,
Who guides the Thunder, *and directs the* Storm.

Tho' it operates by natural Cauſes, yet it is *that* which gives them their Deſtination. For, tho' the Coaſts of the Sea are moſt liable to, and ſuſceptible of this mighty Shock, which we call an Earthquake; yet the chaſtening Rod is directed to *Towns* and *Cities*, where are Inhabitants, the Objects of its Monition; not to *bare Cliffs*, and an *uninhabited Beach*. And there cannot be a more direct Proof, that Earthquakes are divine Judgments, than *this* Obſervation: For, in all antient Hiſtory, Earthquakes are ever found in great Cities. *A. D.* 17, no leſs than 12 flouriſhing Cities in *Aſia minor* were deſtroy'd in one Night. In *A. D.* 1456. at *Naples*, 40,000 People periſhed by an Earthquake. In 1531. in the City of *Lisbon*, 1400 Houſes were thrown down.

We

We ſee and admire the Effects of Electricity, and its ſtupendous Properties, every Day; which ſeems as it were an animating Soul to Matter. The Antients had a Notion that the Earth was a great Animal; probably from ſome Obſervations of Electricity; but certainly, when in our Days we feel theſe unuſual and extraordinary Convulſions of Nature, it is a Leſſon to us, to do our Duty toward that Great Being, who, by a Drop of Water can produce Effects ſo prodigious.

March 13. 1749-50. William Stukely.

XXV.

Extract of a Letter to Mr. J. Ellicott *F.R.S. concerning an* Earthquake *at* Portſmouth, March 18. 1749-50.

Read March 22. 1749. BY a Letter I had from Mr. *Oakes* at *Portſmouth*, dated the 19th inſtant, he gives me an Account of the Inhabitants being alarm'd with a ſevere Shock of an Earthquake on *Sunday* the 18th at Six o' Clock in the Evening; and that it was felt ſtronger at the *Common*, which is about three Quarters of a Mile diſtant.

XXVI.

XXVI.

Extract of a Letter from Portſmouth; *communicated by* Daniel Wray *Eſq*; *F. R. S. concerning the ſame.*

March 19, 1749.

Read March 22. 1749. YESTERDAY, about a Quarter before Six in the Evening, a ſlight Shock of an Earthquake was felt here. I don't find it was general, as many People felt nothing of it. It was felt ſenſibly at Mr. *Carter*'s and Mr. *Taylor*'s; ſo that it is ſomething more than Fancy.

P. S. Since writing the above, I am told the Shock was very violently felt in the *Iſle of Wight* Yeſterday.

XXVII.

The Rev. Wm. Cooper *D. D. Dean of* Durham, *to the* Preſident, *of the* Earthquake *on* March 8. *and of the* luminous Arch, February 16. 1749.

SIR, *Groſvenor's-Street, March* 22, 1749.

Read March 29. 1749. WHILST I was in the Country, I made as much Inquiry into the Progreſs and Extent of the Earthquake Northward as I was able; but could collect very little worth your Notice.

It was felt very ſenſibly at *Northaw*, and at *Gubbins*, the Seat of Sir *Jeremy Sambrooke* in that Neighbourhood, whoſe Houſe was ſhaken very much.

much. At a Farm, three Quarters of a Mile NE of *Hatfield*, it was felt by the Farmer and his Family, but not perceived by the Inhabitants of *Hatfield* itſelf.

In like manner at *Hertingfordbury*, a Village a ſmall Mile Weſt of *Hertford*, the Shock was felt diſtinctly; but not obſerved by any of the Inhabitants of *Hertford*.

At my own Houſe at *Panſhanger*, two Miles Weſt of the above-mention'd Town, the Noiſe was heard twice, at the Interval of about half a Minute, reſembling the Rumbling of a Cart thro' the Streets; but no Shock felt either within or without-doors.

This Circumſtance of the Noiſe being heard without any ſenſible Tremor or Heavings of the Earth, makes me imagine, that the Force of the Vapour was ſpent before it reached that Place; and thereabouts may be reckon'd the Northern Limit of the Earthquake; at leaſt, I have not heard of any Places more to the North that were affected by it. It is no wonder, in a Shock ſo ſudden and alarming, that very few ſatisfactory Obſervations are made, either as to the Nature of the Shock, the Direction of the Tremor, the Time it was felt, or its Duration; of none of which can I give you any Particulars. I ſhould not have troubled you with theſe I have collected, but for my Promiſe; and that I thought that one Obſervation, made at my Houſe, in ſome degree fixed the Extent of the Shock to be limited thereabouts; and might not therefore prove quite an immaterial one.

I cannot help mentioning a luminous Arch, which appear'd *Feb.* 16. about 9 at Night. It had *Arcturus* in

in its Eaſtern Limit, which was then low in the Horizon, and extended to the bright Star in the right Shoulder of *Orion*, then bearing S W. It was exceedingly bright, regular, and well-defin'd, and about the Breadth of the Rainbow; which it reſembled in every thing, but its Variety of Colours. It continued thus for almoſt 20′ Minutes, declining gently Southward, and then gradually ſeparated and diſappear'd. I am,

S I R,

Your very affectionate Friend and Servant,

W. Cowper.

XXVIII.

Extract of a Letter from the Rev. Mr. Taylor, *Vicar of* Portſmouth, *to Mr.* Roderick, *concerning an* Earthquake *felt there*, March 18. 1749-50.

Portſmouth, March 25. 1750.

Read March 29. 1750. I SHALL give you ſome Particulars with regard to the Earthquake, which was felt here on *Sunday* the 18th inſtant.

The firſt Part of the preceding Week was fine Weather. *Wedneſday* Night it became damp and cold, and continued ſo all *Thurſday*, with Miſts. *Friday* was a fine Day; *Saturday* damp and cloudy; *Sunday* Morning fine. Juſt before 6 in the Evening we had ſome large Drops of Rain, and a Thunder-

Cloud paſſed to the SE juſt as the Earthquake happened.

The firſt thing perceived was a Shock, like the ſudden Stop of a Body in Motion; a kind of jarring. This was ſucceeded immediately by a gentle Motion, nearly in the Direction between Eaſt and Weſt; which made 3 or 4 ſlow and deliberate Vibrations. Thoſe who ſat facing the Eaſt or Weſt were moved backward and forward; and thoſe who faced to the North or South were moved ſideways. The Whole was attended with a Noiſe like that of Thunder at a very great Diſtance. It laſted, as I judge by different Accounts, about 4 or 5 Seconds.

I do not hear of any Exploſion. The Saſhes and Door in my Chamber ſhook, as in a Blaſt of Wind a little ſtronger than ordinary. Several, who were on the Battlements of the Church, felt it more violent, and heard the Bell-Frames and Floor ſhake and crack. Few on the Ground, or in Motion, were ſenſible of it.

It was felt at *Havant*, 7 or 8 Miles to the Eaſt, and at *Fitchfield*, 7 Miles to the Weſt.

It paſſed to, or from, the *Iſle of Wight*, where it affected the Ground-Floor, as much as the Chambers here. It ran along the Coaſt between Eaſt and Weſt; but I have not heard that it was perceived at Sea, or went far inland.

I am informed it has been felt at *Guernſey* and *Jerſey*; ſo that if it moved horizontally, it muſt be a conſiderable Depth under-ground; the Soundings from hence to thoſe Iſlands being, in ſome Places, 45 or 50 Fathoms: So that I flatter myſelf, that the ſmall Reſiſtance which it can meet with

at Sea is ſo diſproportionate to what it muſt encounter under ſo many more Fathoms of Earth, that a more violent Return will rather open and diſcharge itſelf there, than do us any conſiderable Miſchief at Land.

XXIX.

Extract of a Letter from Mr. Benj. Cooke *F. R. S. to Mr.* Peter Collinſon, *F. R. S. of a Shock of an* Earthquake *felt in the* Iſle *of* Wight, March 19. 1749-50.

Iſle of Wight, March 26, 1750.

Read March 29. 1750.

BESIDES the Shock. which happen'd here about 6 in the Evening on the 18th Inſtant, as has been mention'd in the public Prints from many neighbouring Places, there was another, which was felt by ſome betwixt 3 and 4 o' Clock next Morning: But whether this latter was as extenſive as the former, I cannot yet learn.

In the Evening Shock, a Gentleman of my Acquaintance was ſitting alone in his Parlour by the Fire with the Doors ſhut; the Spaniel Dog, which lay as it were aſleep before him, was ſo terrified at the unuſual Motion, that he ran round the Room in the greateſt Fright and Confuſion, as endeavouring to find a Way of Eſcape.

XXX.

Extract of a Letter from a Gentleman at Southampton *to* Joſiah Colebrooke, *Apothecary, F. R. S. of the Shocks felt in thoſe Parts,* March 18 *and* 19. 1749-50.

March 19. 1749.

Read March 29. 1750. WE have had nothing of an Earthquake in theſe Parts till laſt *Sunday* Evening, when they had it all over the *Iſle of Wight*. My Son wrote me the following Account of it, which is dated at *Newport*, on *Monday* the 19th:

" Laſt Night, juſt at 6 o' Clock, as my Aunt " and I were ſitting together, we felt an Earth- " quake, and a terrible one I think. At firſt we " heard a ſmall Noiſe, which we ſuppoſed was a " Chariot; and, as the Noiſe grew louder, the " Houſe began to ſhake; till at laſt the Noiſe grew " ſo loud, and the Houſe ſhook ſo much, that we " expected it would fall down. I believe it con- " tinued near a Minute; and it was a great Mercy " we were not all conſumed. I confeſs I was " dreadfully frighten'd. We had nothing fell down " from the Shelves in our Houſe; but both our " Neighbours had Things thrown down from their " Shelves. I heard a Man ſay there was another " Shock this Morning between Three and Four of " the Clock, but we felt nothing of that. I be- " lieve it was felt all over the Iſland; for here is " a Man in Town who felt it at *St. Helen's*."

Yeſterday

Yeſterday I heard they had a little of it at *Portſmouth* and *Lymington:* And a Servant-Maid in this Town ſays, ſhe felt her Chair ſhake; and the Windows ſhook, and the Wainſcot crack'd, juſt at the ſame time: But I neither felt it, nor can find any body beſides that did.

XXXI.

A Letter from Mr. Peter Newcome *F. R. S. to the* Preſident, *concerning the ſame Shock being felt at* Hackney, *near* London.

SIR,

Read March 29. 1750. I BEG Leave to give you ſome Account of what was felt in our Houſe at *Hackney,* on *Sunday* the 18th, a little after 6 o' Clock in the Evening; as we have received Accounts of the Shock of an Earthquake being felt at *Bath, Portſmouth,* and ſome other Places on that Day.

My Couſin *Peter Newcome* was ſitting in his Chamber on the upper Floor of the Houſe, looking towards the Fire, when he plainly perceiv'd the Hearth of his Chimney to be moved; and immediately felt the Chamber rock three or four times from Weſt to Eaſt; but heard no Noiſe, as at the time of that Shock felt on the 8th.

Being much ſurpriſed, he was running downſtairs, and there met with one of the Maid-Servants, who was running in a great Fright out of another Room

Room on the ſame Floor; and, before they could ſpeak, a young Gentleman, of about 15 Years old, came out of a Cloſet juſt by, and they all at one Moment asked each other if what they had felt was not another Earthquake.

In a Chamber on the Floor below, Maſter *Hadley*, Son to the late Mr. *Hadley* of this *Society*, was in his Bed, being ill of a Cold; he felt the Bed move upwards ſo ſenſibly, that he imagin'd ſomebody had got under it out of Wantonneſs, and was lifting it up; and actually got out to look under the Bed.

The ſame was felt by another Servant, on the upper Floor, at the other End of the Houſe; and by another young Gentleman underneath in that Part alſo. The reſt of the Family, being all together below-ſtairs, felt nothing of it. I am,

SIR,

Hackney, March 29. 1750. *Your moſt obedient Servant*,

P. Newcome.

XXXII.

XXXII.

A Letter from James Burrow *Eſquire, F. R. S. to* Peter Daval *Eſq*; Secr. R. S. *concerning the ſame* Earthquake *being felt at* Eaſt Sheen, *near* Richmond *Park in* Surrey.

Dear Sir, *March* 30. 1750.

Read April 5. 1750. I AM very much obliged to you for the Opportunity of peruſing thoſe Papers, which I intended and ought to have come and heard read. If I had been preſent, I would have (in ſome meaſure) confirmed Mr. *Newcome's* Account of what was perceived in his Houſe at *Hackney*, by a ſimilar Teſtimony from *Eaſt Sheen* near *Richmond Park* in *Surrey*. It depends indeed upon the Perception of a ſingle Perſon; whereas *his* is verified by the Senſations of ſix different ones; but it is exactly parallel, as to the being felt above-ſtairs, but not below.

On *Sunday* the 18th inſtant, at a very little after 6 in the Afternoon, as Miſs *Lethieullier* was ſitting in her Dreſſing-Room up two Pair of Stairs, fronting to the South, with a Book before her, ſhe felt ſuch a Shock of an Earthquake, as ſhe apprehended, that ſhe immediately ran down-ſtairs, frighted; and finding Mr. *Lethieullier* her Father, and another Perſon, ſitting together in the Parlour, asked them, "if "they had not felt another Shock of an Earthquake."

But,

But, finding that neither they, nor any one elſe, had perceived any thing like it, ſhe neither ſaid or thought any more of it; ſuſpecting it might be only a ſudden Guſt of Wind, or ſome other accidental Cauſe.

On reading the Accounts in the public Papers of a real Shock of an Earthquake being felt at *Portſmouth*, at the *Iſle of Wight*, and at other Places, exactly at the ſame time, her Father, and the Gentlewoman who was in the Parlour with him, began to doubt whether the young Lady's Apprehenſion was not founded upon ſomewhat more than mere Fancy or Imagination; and Mr. *Newcome*'s Account ſeems to render it probable that ſhe felt a real Motion.

Whether it was, or was not, I don't pretend to determine; and ſhould ſcarce have mention'd it, if it had not ſo exactly coincided with what Mr. *Newcome* has communicated. I have no doubt of the Fact above rehearſed; having been aſſured of it by all the three Perſons before ſpoken of, who firſt mention'd it in an accidental Converſation upon the Subject, and afterwards (on being particularly interrogated) poſitively and expreſly atteſted it. I am,

Dear Sir,

Your moſt humble Servant,

James Burrow.

XXXIII.

XXXIII.

The Rev. Wm. Stukeley *M. D. F. R. S. to the* Preſident, *concerning the Cauſes of* Earthquakes §.

Read April 5. 1750. AMONG all the Appearances of Nature, which are the Subjects of the Inquiries of the *Royal Society*, none would more ſenſibly affect the Minds of contemplative Perſons than that of an Earthquake; eſpecially to us in this Country, where they ſo ſeldom happen.

When I had the Honour laſt *Thurſday* * to lay my Thoughts upon it before the *Society*, I found that ſome worthy Members had not fully enter'd into my Way of Reaſoning; nor with that Seriouſneſs ſo awful a Subject requir'd: Therefore I judg'd it neceſſary to treat upon it in a more diffuſive manner; and with ſome further Conſiderations relating to that Argument.

Among the numerous Accounts received here, and Obſervations upon the Manner of it, I judg'd it became the *Society* to inquire into the Cauſe of ſo extraordinary a Motion, of which we could not have form'd a proper Idea, had we not repeatedly both ſeen and felt it.

The Notions of the Antients are ſufficiently known; nor have the Moderns any-way improv'd upon them, any further than by ſome chymical Mixtures. The vulgar Opinion goes no deeper than ſome Caverns, not far below the Surface of the Earth; wherein are ingender'd Vapours, Ex-

 ploſions,

§ This Paper is printed by the Author in a Pamphlet in 8*vo*. *London*, 1750. * See this *Tranſ.* p. 641.

ploſions, Fermentations, and Fires from inflammable Minerals, that cauſe theſe Convulſions of the Surface.

I ſhall not pretend to deny, that there may be ſuch Vapours, Fermentations, Rarefactions, and inflammable Subſtances, and actual Fires, in the Bowels of the Earth, and that there may be ſome Caverns under-ground, as well as we find ſome few above-ground, *Pool's Hole*, *Okey Hole*, and the like, in mountainous Countries. We know there are hot Springs running continually, and *Vulcano's* frequently belching out Flames and Smoke; and to theſe, moſt probably, ſome ſmaller Earthquakes are owing.

But theſe Matters are very rare, much rarer than Earthquakes, both as to Time and Place. *Veſuvius* in *Italy*, and in that Part of it abounding with Mines of Sulphur; *Ætna* in *Sicily*; ſome on the great *Andes* Mountains in *America*, and the like. The Scarcity of them, in my Opinion, is ſo far from being a Proof of the general cavernous State of the Earth, that it ſtrongly proves the contrary.

How many thouſand Acres of Coal-Mines, Stone-Pits, and the like, do they daily work in *England*, and have done for Ages? I have been myſelf 100 Yards deep in a Salt-Rock. I have walked half a Mile lengthwiſe, directly into the Earth, and under the Bed of the Ocean: But we never hear, from the many Hundreds of Thouſands of Workmen in this kind, of the cavernous State of the Earth.

On the contrary, by their hard Labour they confeſs it far otherwiſe. Nor have we any Reaſon, in *England*, to believe there are great Mines of Sulphur, and

and inflammable Minerals: Nor, if there were, could they burn, and cauſe Convulſions of the Earth, unleſs there were proper Cavities, and Conveyances of Air; as in Coal-Pits, when ſet on fire.

But even from theſe Coal-Pits, when fired, do we ever find any thing like an Earthquake produc'd? Nor did we obſerve, in theſe two laſt Earthquakes, any Fire, Vapour, Smoke, or Smell; or any kind of Eruption in the leaſt, in ſo great a Struggle of the Superfice, as affected a Circle of 30 Miles in Diameter.

Indeed this Conſideration alone, of the Extent of this Surface, is ſufficient to overthrow any Suppoſition of Earthquakes being *chiefly* owing to ſubterraneous Vapours. For it cannot poſſibly be imagined, that ſuch can have ſo immenſe a Force, as to act upon that Compaſs inſtantaneouſly, all at once, and never break Ground, ſo as to be diſcoverable to Sight or Smell. Many Accounts we have of a little Fire-ball burſting in the Air, at a great Diſtance, and inſtantly propagating a ſulphureous Smell all around it for Miles.

If the Motion of a Superficies of 30 Miles Diameter was owing to Fumes and Vapours, we ought reaſonably to find ſome great Diſcharge of them, like a Coal-Pit fired: The Operation of it ought to be Hours and Days in Continuance, not inſtantaneous: And the Evaporation of ſuch a Quantity of inflammable Matter requires a long time to evacuate itſelf.

There is another Argument, which, in my Opinion, utterly overthrows theſe Suppoſitions; and that is, a due Conſideration of Springs. If we would

form any tolerable Idea of the Nature of Springs and Fountains perpetually flowing, and *that* (generally ſpeaking) from the Creation of the World, we muſt needs conceive, that GOD ALMIGHTY has laid their Pipes and Canals in the Earth, like as he has planted the Veins, Arteries, and Glands, in an animal Body; and that likewiſe they are more and more ramify'd, as they nearer approach the outward Shell of the Earth.

The Workmen in Coal-Mines, and the like, never fail to meet with the Veins of Springs every-where: They that dig for Wells ſeldom fail of finding Water every-where. The Colliers are obliged to drain, at very great and continual Expence. A Circumſtance not very favourable to ſubterraneous Fires.

Now it is apparent enough, that the Hypotheſis of Vapours, and ſubterraneous Fermentations, Exploſions, and Eruptions, being the Cauſe of Earthquakes, muſt abſolutely ruin the whole Syſtem of Springs and Fountains, where-ever it has once been. But this is quite contrary to Fact; even where an Earthquake has been repeatedly; for Inſtance, from home.

On *Wedneſday*, *April* 6. 1580. about 6 in the Evening, juſt ſuch another Earthquake was felt in *London*, and around it, as theſe two we have ſeen. Another, exactly ſimilar, in 1692. In all theſe 4 no Houſes thrown down, nor any Springs diſturb'd thereby: No ſenſible Eruptions or Smells.

Theſe Conſiderations I apply only to this little inconſiderable Space of a Circle of 30 Miles Diameter. But what is that to the Appearance of ſome

Earthquakes

Earthquakes we read of in Hiſtory? In the Year of our Lord 17. no leſs than 13 great and noble Cities of *Aſia minor* were deſtroy'd in one Night. The Fact is ſo notorious, that ſome Perſons here preſent have ſeen a vaſt Block of white Marble, now ſtanding near *Naples*, being the Pedeſtal of a Coloſs Statue of *Tiberius* the Emperor, having carv'd on it, in *Baſſo relievo*, the *Genius's* of all thoſe Cities, with their Names; which were rebuilt by that Emperor.

Without going ſo far, we may ſee another Evidence of it, a Coin of that Emperor ſtruck upon it, with this Inſcription,

CIVITATIBUS ASIAE RESTITVTIS.

I have one of them in large Braſs, which was found at *Colcheſter*.

The Compaſs of this Earthquake may be reckon'd to take up 300 Miles in Diameter. How can we poſſibly conceive the Action of any ſubterraneous Vapours to produce ſuch an Effect, as inſtantaneouſly to demoliſh all theſe Cities? And that ſuch an Accident ſhould never happen after? How comes it to paſs, that the whole Country of *Aſia minor* was not at the ſame time deſtroy'd, its Mountains renverſed, its Fountains and Springs broken up, and ruin'd for ever, and its Rivers diſannull'd? Inſtead whereof, we find nothing ſuffer'd, but thoſe Cities; no kind of Alteration in the Surface of the Country, which remains the ſame to this Day.

From theſe Conſiderations therefore, I cannot perſuade myſelf eaſily to enter into the Opinion of Earthquakes *generally* ariſing from pent-up Vapours

and

and Eruptions. I know there are many ſtrange Relations of Effects of ſubterraneous Fires, told by Authors that deal pretty much in the Marvellous, and whoſe Minds were prepoſſeſſed with thoſe vulgar Notions. My Conceptions of the Matter are deriv'd from the more general Appearances, and what we have ſeen and felt ourſelves.

After we have treated this Argument in a ſuperficial View, we muſt go a little deeper. If we would conſider things like Philoſophers, let us propoſe to ourſelves this Problem;

Where is the Power to be plac'd, that is requir'd to move a Surface of Earth 30 *Miles in Diameter?*

To anſwer this, conſult the Engineers, and thoſe that make Mines in the Sieges of Towns. They will acquaint us, that the Effect of Mines is produc'd in Form of an inverted Cone: And that a Diameter of 30 Miles in Baſe, will require an Axis of 15 or 20 Miles to operate upon that Baſe, ſo as to ſhake it, at leaſt. So that the Vapours, and whatever Power we propoſe to operate upon that Baſe, according to the foregoing Hypotheſis, in order to form the Appearance of an Earthquake, muſt be 15 or 20 Miles deep in the Earth.

But what Mind can conceive, that any natural Power is able to move an inverted Cone of ſolid Earth, whoſe Baſe is 30 Miles in Diameter, and Axis 20? Or, was it poſſible, would not the whole Texture of that Body be quite diſturb'd and ſhatter'd; eſpecially in regard to its Springs and Fountains? But nothing like this is ever found to be the Conſequence of an Earthquake, tho' fatal to Cities.

Apply

Apply this Reaſoning to the Earthquake of *Aſia minor*; and this vigorous Principle muſt lie at leaſt 200 Miles deep in the Ground. Enough to ſhew the Abſurdity of it. A Cone of 300 Miles Diameter at Baſe, and 200 Miles Axis; I dare be bold to ſay, that all the Gunpowder made ſince its Invention, put together, would not be able to move it. How much leſs would pent-up Vapours?

And, could it be admitted as a thing poſſible, will any one be perſuaded, that ſuch a ſubterraneous Tumult, of ſo vaſt an Extent, will be no-ways injurious to the internal Syſtem of Springs and Fountains? We may as well imagine, that we may ſtab a Man 100 times, and never touch a Vein or Artery.

In an Age when Electricity has been ſo much our Entertainment, and our Amazement; when we are become ſo well acquainted with its ſtupendous Powers and Properties, its Velocity, and inſtantaneous Operation, thro' any given Diſtances; when we ſee, upon a Touch, or an Approach, between an Electric and a Non-electric, what a wonderful Vibration is produced, what a Snap it gives, how a lambent Flame breaks forth, how violent a Shock; is it to be wonder'd at, that hither we turn our Thoughts, for a Solution of the prodigious Appearance of an Earthquake?

It is every body's Obſervation, that there never was a Winter like the paſt, for Warmth and Drineſs, Thunder and Lightning very uncommon then; for Coruſcations in the Air, juſtly thought to be electrical; eſpecially for that call'd *Aurora auſtralis*; the Wind continually South and South-weſt, and that without Rain, which is unuſual. This State

of

of the Atmoſphere had continued 5 or 6 Months, before the firſt Earthquake: Is it not hence reaſonable to conclude, that the Earth muſt, eſpecially in our Region, be brought into an unuſual State of Electricity; and, conſequently, wanted nought, but the Approach of a non-electric Body, to produce the Snap, and the Shock of Electricity?

That the Earth was in that vibratory and electric State, we have further Reaſon to conclude, from the very extraordinary Forwardneſs of all the vegetable World with us. Every one knows, that, at the End of *February*, all ſorts of Garden-ſtuff, Fruits, Flowers, Trees, were as forward as, in other Years, in the Middle of *April*. Conformable to which, Experiments abundantly ſhew us, that electrifying of Plants quickens their Growth; for the ſame Reaſon as in Animals it quickens the Pulſe.

Any ſolid Matter is capable of being put into a State of Electricity; ſuch as iron Guns; and the more ſo, by reaſon of their Solidity: And in proportion to it is the Greatneſs of the Snap, and of the Shock; and a kind of lambent Flame iſſues out of the Point of Contact; and likewiſe ſomewhat of the ſulphureous Smell. So that if both Flame and Smell were diſcernible in an Earthquake, it is to be found, without going to the Bowels of the Earth.

As to the immediate Cauſe of this wonderful Appearance of an Earthquake, I hinted that it was owing to a non-electric Body coming near or touching the Earth, when in its electrify'd State; which may be a Shower of Rain: And the learned Dr. *Childrey* obſerves, that Earthquakes always ſucceed Rain:

Rain. A ſudden Tempeſt of Rain, in the Time of a great Drought.

At the ſame time that the Force of Electricity in Solids is as the Quantity of Matter, we ſee moſt evidently, that Water is equally forcible in ſtrengthening and conducting it, and that in proportion to its Quantity: Which very much juſtifies my Obſervation, that moſt frequent Earthquakes have fallen upon maritime Places. And I find the ſame Obſervation is made before me by *Acoſta* and *Dolittle*, who wrote on that in 1692. and others. In the dreadful Cataſtrophe of *Port-royal*, it is notorious, that its Violence was chiefly near the Sea: And even in thoſe ſo lately felt by us, they were ſenſibly more violent toward the River, than further from it. And in that Earthquake in *England*, in 1692. (which was very much like that we are treating of) there were no Houſes thrown down, nor Perſons kill'd; but it reach'd more particularly *Sandwich*, *Deal*, *Dover*, *Sheerneſs*, *Portſmouth*, and the maritime Parts of *Holland*, *Flanders*, and *Normandy*.

In this that happen'd laſt *Sunday* at 6 in the Evening at *Bath*, it was felt particularly at *Portſmouth*, the whole *Iſle of Wight*, and *Jerſey*.

If we look into antient Hiſtory, we find, in the 197th Year before Chriſt, an Earthquake ſhook terribly the Iſle of *Rhodes*, damag'd many Cities, and ſome were ſwallow'd up.

17 Years before Chriſt, many Cities in the Iſle of *Cyprus* were deſtroy'd.

6 Years before Chriſt, the Iſle of *Coos* was moſt vehemently afflicted.

During the *Peloponneſian* War among the *Greeks*, the Iſle of *Delos* was afflicted, and the moſt beautiful Temple of *Apollo* thrown down.

Soon after, the City of *Lacedæmon* was totally deſtroy'd.

A. D. 79. three Cities in *Cyprus* were overthrown.

A. D. 182. the City of *Smyrna* was ruin'd.

Conſtantinople has often ſuffer'd; particularly in 1509. 13000 People overwhelm'd.

A. D. 1456. in the City of *Naples* 40000 People were deſtroy'd.

In 1531. at *Lisbon*, 1400 Houſes were thrown down, and near as many ſhatter'd.

In the Time of *Valens* the Emperor, a terrible Earthquake happen'd in *Crete*, whereby 100 Cities were deſtroy'd.

But Inſtances enough, to ſhew what I aim'd at, that maritime Places are moſt ſubject: Which is no contemptible Argument in Favour of Electricity; when both the Solid of the Earth, and the Quantity of the Water, concur to make the Shock exactly, as in common electrical Experiments.

The Gardener in the *Temple* Garden obſerv'd the Sound to roll from the Water-ſide toward *Temple-Bar*, before the ceaſing of the Nodding of the Houſes; juſt as the electrical Snap precedes the Shock. Others, that write upon Earthquakes, commonly obſerve, that the Noiſe precedes the Shock. But it is obvious it muſt be quite the contrary, did the Concuſſion depend on a ſubterraneous Eruption.

We may well enough expect, that burſting Vapours, and ſubterraneous Exploſions, ſhould diſperſe every

every thing that happen'd in their Way into the Air: But, in my Apprehenſion, it is not poſſible for us to imagine any thing to produce ſuch a Vibration as we felt, but Electricity.

Several People felt Pains in their Joints, Rheumatiſm, Sickneſs, Head-ach, Pain in their Back, Colic, hyſteric and nervous Diſorders, for the whole Day after, and longer (eſpecially weak Conſtitutions), exactly as upon Electrification; and to ſome it has prov'd fatal.

Upon this Principle alone can we account for the Fiſhes leaping out of the Ponds; or a ſort of Thump felt at the Bottom of a Boat. Nay, we are told of Earthquakes felt at Sea, far diſtant from Land: Which are eaſily ſolv'd by an electrical Shock impreſs'd upon the Water: But we cannot eaſily ſee Vapours and Fires reſiding at the Bottom of the Ocean.

From electrical Vibration alone can we account for that Obſervation of Springs and Fountains being no-ways damaged after an Earthquake. I doubt not but they run more plentifully at that time; juſt as the Blood circulates quicker upon Electrification.

From Electrification only can we account for this Particular. The Walls of *Weſtminſter-Hall* are of no mean Thickneſs; yet thoſe that ſat with their Backs to it, during the Shock, all relate that it ſeem'd to puſh toward them with great Force. So in that of 1692. at *Deal*, the Wall of the Caſtle, which is of an extraordinary Thickneſs and Strength, ſhook ſo much, that the People living in it expected it would have fallen on their Heads.

For thus the Force of the electrical Shock is proportionate to the Quantity of the Solid. And were

Fumes and lambent Flames ſeen to iſſue out of the gaping Ground on theſe Diſaſters, as Relations tell us, we juſtly may pronounce them to be purely the Effect of Electricity.

It muſt be accounted no inconſiderable Argument in Favour of our Hypotheſis, that the Northern Regions of the World are little ſubject to Earthquakes, in compariſon of the Southern; where the Warmth and Drineſs of the Air, ſo neceſſary in Electricity, is common. Notwithſtanding that we have a Vulcano in *Iceland*, yet we hear not of Earthquakes frequent in that Latitude of the Globe.

But whether our Conjectures upon this important Affair be well founded or no, it certainly becomes a Chriſtian Philoſopher, whilſt he is inveſtigating material Cauſes, to look up to the moral Uſe of them; for, in reality, every thing in the whole World was ultimately made for that Purpoſe. And of all the great and public Calamities which affect us Mortals, Earthquakes claim the firſt Title to the Name of Warnings and Judgments; none ſo proper to threaten, or to execute Vengeance: Nor has any other thoſe annexed Terrors, ſo much of the unuſual, the unavoidable, and the horrible Apprehenſion of being cruſh'd to Death, or buried alive.

I cannot but inſiſt upon my former Obſervation to be juſt, that Earthquakes proclaim themſelves to Mankind in this Light; becauſe peculiarly directed to great Cities and maritime; abounding with Wealth and Luxury. It would be childiſh to make a long Recital of Particulars from Hiſtory; for had we no other ſort of Notices of Earthquakes? Look upon thoſe two Shocks we have felt. We own, that

that *Hamſtead-Heath*, and *Finchley-Common*, and *Kennington-Common*, may have been affected with it; yet it is notorious, that *London* was the Centre; the Place to which the Finger of GOD was pointed.

XXXIV.

Some Conſiderations on the Cauſes of Earthquakes. *By the Rev.* Stephen Hales, *D. D.* and *F. R. S.*

Read April 5. 1750.

AS the late Earthquakes in *London*, and ſome other Parts of *England*, have rouſed the Attention of Mankind, to conſider the Cauſes of them, both in a religious and natural View: And as in a religious View they have been conſidered by the Biſhop of *London*, in his excellent Letter to the Clergy and People of *London*, which has been received with general Approbation: So I ſhall here give a ſhort Account of what ſeems to me to be a probable natural Cauſe of them.

But I muſt firſt obviate an Objection of ſome ſerious well-meaning People, who are apt to be offended at any Attempts to give a natural Account of Earthquakes; which, but rarely happening in theſe more northern Parts, are apt to be looked upon as the more miraculous. But it ought to be conſidered, that the ordinary Courſe of Nature is as much carried on by the Divine Agency, as the extraordinary and miraculous Events. God ſometimes changes the Order of Nature, with Deſign to chaſtiſe Man for his Diſobedience

obedience and Follies; natural Evils being graciouſly deſigned by him as moral Goods: All Events are under his Direction, and fulfil his Will.

On the other hand, there are ſome who make light of Earthquakes, becauſe they are capable of being accounted for by natural Cauſes. But the Hand of God is not to be overlooked in theſe things, under whoſe Government all natural Agents act; eſpecially ſuch rare and unuſual Events as Earthquakes. God uſes all Creatures to be the Inſtruments of his Will: Natural and moral Agents are all under his Direction. When he inflicts a Famine on a Nation, it is not the leſs the Hand of God, becauſe we know the natural Cauſes of it, *viz.* great Drought, and unkindly Seaſons: *Fire and Hail, Snow and Vapour, and ſtormy Wind, fulfil his Word,* Pſal. cxlviii. 8. Infectious Air, peſtilential Diſeaſes, and Earthquakes, however occaſioned by natural Cauſes, are under the Divine Influence. He not only orders and directs the Operations of Nature, but alſo influences the Actions of moral Agents, turning, as he pleaſes, the Hearts of the Governors of the Nations, ſo as frequently to chaſtize Mankind by that ſevere Scourge, and great Diſgrace of human Nature, War. Earthquakes are not therefore ſlightly to be regarded, becauſe we think we can give a probable natural Account of them; neither ought we, on that Account, to encourage ourſelves to go careleſly on in wicked Courſes. If national Judgments do not overtake us, yet it cannot be long before we ſhall come into the Puniſhment of our future State: *And tho' Sentence againſt an evil Work is not ſpeedily executed, tho' a Sinner do Evil an hundred*

dred times, and his Days be prolonged; yet ſurely I know it ſhall not be well with the Wicked. Eccleſ. viii. 11, 12, 13.

It may not be improper, on this Occaſion, to mention another conſtant and uninterrupted Plague, in which, of late Years, we have been, and are like to continue Sufferers, in common with many other Nations. A Plague, of all others the greateſt that ever befel unhappy Man; it being by far the moſt deſtructive, not only of the Lives, but alſo of the Morals, of Mankind; both a natural and a moral Evil: I mean fermented diſtilled Spirituous Liquors of all Denominations. Did God Almighty deſtroy as many by Earthquakes as are yearly deſtroyed by diſtilled Spirituous Liquors, which is probably about a Million of Perſons in a Year all over the World; how great a Terror and Conſternation would it cauſe every where! But, alas! with what Unconcernedneſs, with what Calmneſs, and even Complacency, is this enormous both natural and moral Evil received, and even foſtered, among us; inſomuch that it is now become, by a juſt Judgment, the Curſe and the Puniſhment of the World, even the greateſt that ever befel unhappy Man! Notwithſtanding which, this inchanting *Siren* ſo bewitches and infatuates the Nations, that it ſpreads its baleful Influence far and wide, making yearly farther and farther Devaſtations, both of the Lives and Morals of Mankind, and even debaſing the Breed of Man.

As to the Affair of Earthquakes, particularly that which happened at *London* the 8th of *March* laſt, about 20 Minutes before 6 in the Morning; I being then awake in Bed, on a Ground-floor, near the

Church

Church of *St. Martin's in the Fields*, very ſenſibly felt the Bed heave, and conſequently the Earth muſt heave too. There was a hollow, obſcure, ruſhing Noiſe in the Houſe, which ended in a loud Exploſion up in the Air, like that of a ſmall Cannon: The whole Duration, from the Beginning to the End of the Earthquake, ſeemed to be about 4 Seconds of Time. The Soldiers who were upon Duty in *St. James's Park*, and others who were then up, ſaw a blackiſh Cloud, with conſiderable Lightning, juſt before the Earthquake began; it was alſo very calm Weather.

In the Hiſtory of Earthquakes it is obſerved, that they generally begin in calm Weather, with a black Cloud. And when the Air is clear, juſt before an Earthquake, yet there are then often Signs of Plenty of inflammable ſulphureous Matter in the Air; ſuch as *Ignes Fatui* or *Jack-a-Lanterns*, and the Meteors called falling Stars.

Now, I have ſhewn many Years ſince, in the Appendix to my *Statical Eſſays*, Experiment 3. Page 280. the Effect that the Mixture of a pure and ſulphureous Air have on each other; *viz.* by turning the Mouth downwards, into a Pan of Water, of a Glaſs Veſſel of a Capacity ſufficient to hold about two Quarts, with a Neck about twenty Inches long, and two Inches wide. Then, by putting under it, in a proper Glaſs Veſſel, with a long narrow Neck, a Mixture of *Aqua fortis*, and powdered Pyrites, *viz.* the Stone with which Vitriol is made, there will be a brisk Ferment, which will fill the Glaſs with rediſh ſulphureous Fumes; which, by generating more Air than they deſtroy, will cauſe the Water, with

with which the whole Neck of the Glaſs Veſſel was filled, to ſubſide conſiderably. When the rediſh ſulphureous Air in the upper Part of the Glaſs is clear, by ſtanding two or three Hours, if then the Mouth of the inverted Glaſs is lifted out of the Water, ſo as to let the Water in the Neck of the Glaſs fall out; which, ſuppoſing it to be a Pint, then an equal Quantity of freſh Air will ruſh in at the Mouth of the Neck of the Veſſel, which muſt immediately be immerſed in the Water: And upon the Mixture of the freſh Air with the then clear ſulphureous Air, there will inſtantly ariſe a violent Agitation between the two Airs, and they will become, from tranſparent and clear, a rediſh turbid Fume, of the Colour of thoſe Vapours which were ſeen ſeveral Evenings before the late Earthquakes: During which Effervescence, a Quantity of Air, nearly equal to what freſh Air was let in, will be deſtroyed; which is evident by the riſing up of the Water in the Neck of the Glaſs, almoſt as high as before. And if, after the Effervescence of the mixed Airs is over, and become clear again, freſh Air be admitted, as before, they will again grow reddiſh and turbid, and deſtroy the new-admitted Air as before; and this after ſeveral repeated Admiſſions of freſh Air: But after every Readmiſſion of freſh Air the Quantity deſtroyed will be leſs and leſs, till no more will be deſtroyed. And it is the ſame after ſtanding ſeveral Weeks, provided, in the mean time, too much freſh Air had not been admitted. Now, I found the Sum total of the freſh Air thus deſtroyed to be nearly equal to the firſt Quantity of ſulphureous Air in the inverted Glaſs.

Since we have in this Experiment a full Proof of the brisk Agitation and Effervescence which arises from the Mixture of fresh Air with Air that is impregnated with sulphureous Vapours, which arise from several mineral Substances, especially from the *Pyrites*, which abounds in many Parts of the Earth; may we not with good Reason conclude, that the irksome Heat, which we feel in what is called a close sultry Temperature of the Air, is occasioned by the intestine Motion between the Air and the sulphureous Vapours, which are exhaled from the Earth? Which Effervescence ceases, as soon as the Vapours are equably and uniformly mixed in the Air; as happens also in the Effervescences and Ferments of other Liquors. The common Observation therefore, that Lightning cools the Air, seems to be founded on good Reason; that being the utmost and last Effort of this Effervescence.

May we not hence also, with good Probability, conclude, that the first Kindling of Lightning is effected by the sudden Mixture of the pure serene Air above the Clouds, with the sulphureous Vapours, which are sometimes raised in Plenty, immediately below the Clouds? The most dreadful Thunders being usually when the Air is very black with Clouds; it rarely thundering without Clouds: Clouds serving, in this Case, like the above-mention'd inverted Glasses, as a Partition between the pure and sulphureous Airs: Which must therefore, upon their sudden Admixture thro' the Interstices of the Clouds, make (like the two Airs in the Glass) a more violent Effervescence, than if those Airs had, without the Intervention of the Clouds, more gradually

dually intermixed, by the conſtant more gradual Aſcent of the warmer ſulphureous Vapours from the Earth, and Deſcent of the cold ſerene Air from above. And tho' there was no luminous Flaſh of Light in the Glaſs, yet, when ſuch ſudden Effervescence ariſes, among a vaſt Quantity of ſuch Vapours in the open Expanſe of Air, it may, not improbably, acquire ſo rapid a Velocity, as to kindle the ſulphureous Vapours, and thereby become luminous.

And ſince, from the Effects that Lightning is obſerved to have on the Lungs of Animals, which it often kills, by deſtroying the Air's Elaſticity in them, as alſo from its burſting Windows outwards, by deſtroying the Air's Elaſticity on the Outſide of thoſe Windows: Since, I ſay, it is hence probable, that the ſulphureous Fumes do deſtroy a great Quantity of elaſtic Air; it ſhould therefore cauſe great Commotions and Concuſſions in the Air, when the Air ruſhes into thoſe evacuated Places; which it muſt neceſſarily do with great Velocity.

Dr. *Papin* has calculated the Velocity with which Air ruſhes into an exhauſted Receiver, when driven by the whole Preſſure of the Atmoſphere, to be at the Rate of 1305 Feet in a Second of Time; which is at the Rate of 889 Miles in an Hour: Which is near 18 times a greater Velocity than that of the ſtrongeſt Storms; which is eſtimated to be at the Rate of 50 Miles in an Hour *.

Hence

* *Phil. Tranſ. n.* 184, *p.* 195. Lowthorp's *Abridgment of* Phil. Tranſ. Vol. I. p. 586.

Hence, we ſee that an outrageous Hurricane may be cauſed, by deſtroying a ſmall Proportion of the Elaſticity of the Air of any Place, in reſpect to the Whole. No Wonder then that ſuch violent Commotions of the Air ſhould produce Hurricanes and Thunder-Showers; eſpecially in the warmer Climates; where both the ſulphureous and watry Vapours, being rais'd much higher, and in greater Plenty, cauſe more violent Effects.

Monſieur *de Buffon*, in his Natural Hiſtory and Theory of the Earth, mentions black dark Clouds in the Air near the tempeſtuous *Cape of Good Hope*, and alſo in the Ocean of *Guiney*, which are called by the Sailors the *Ox's Eye*; which are often the Forerunners of terrible Storms and Hurricanes. Whence it is to be ſuſpected, that they are large Collections of ſulphureous Vapours; which, by deſtroying ſuddenly a great Quantity of the elaſtic Air, cauſe the ambient Air to ruſh with great Violence into that Vacuity, thereby producing Tempeſts and Hurricanes. And off the Coaſt of *Guiney* they have ſometimes three or four of theſe Hurricanes in a Day; the Forerunners of which are theſe black ſulphureous Clouds, with a ſerene clear Air, and calm Sea; which on a ſudden turns tempeſtuous, on the Exploſion of theſe ſulphureous Clouds. And in *Jamaica* they never have an Earthquake when there is a Wind to diſperſe the ſulphureous Vapours.

In the like manner we find, in the late Earthquakes at *London*, and in the Accounts of many other Earthquakes, that, before they happen, there is uſually a calm Air, with a black ſulphureous Cloud: Which Cloud would probably be diſperſed like

like a Fog, were there a Wind: Which Diſperſion would prevent the Earthquake; which is probably caus'd by the exploſive Lightning of this ſulphureous Cloud; being both nearer the Earth than common Lightnings; and alſo at a time when ſulphureous Vapours are riſing from the Earth in greater Quantity than uſual; which is often occaſion'd by a long Series of hot and dry Weather. In which combined Circumſtances, the aſcending ſulphureous Vapours in the Earth may probably take Fire, and thereby cauſe an Earth-Lightning; which is at firſt kindled at the Surface, and not at great Depths, as has been thought: And the Exploſion of this Lightning is the immediate Cauſe of an Earthquake.

It is in the like manner that thoſe Meteors, which are called falling Stars, are ſuppoſed to be kindled into a Flame at the upper Part of a ſulphureous Train, which is kindled downwards into a Flame, in the ſame manner as a freſh-blown-out Candle is inſtantly lighted from another Candle held over it at a Diſtance, in the ſulphureous inflammable Smoke of it.

I am ſenſible that it may ſeem improbable, that the aſcending ſulphureous Vapours in the Earth ſhould thus be kindled; but, ſince they are continually aſcending thro' the Pores of the Earth, more or leſs, for many good and uſeful Purpoſes, it is plain there is Room for them to paſs. Beſides, as Monſ. *de Buffon* remarks, Naturaliſts have obſerved perpendicular and oblique Clefts, in all Kinds of Layers of Earth, not only among Rocks, but alſo among all Kinds of Earth, that have not been removed, as is obſervable wherever the Earth is open to any Depth. Now

theſe

theſe Cleſts are cauſed by the drying of the ſeveral horizontal Layers of the Earth; and will alſo be conſiderably the wider in long dry hot Seaſons, which are uſually the preparatory Forerunners of Earthquakes, and the Exploſion of the ſulphureous Vapours may probably widen them more.

It is very obſervable, in the Opinion of *Borelli*, and other Naturaliſts, that *Volcano's* begin firſt to kindle near the Surface or Top of the Mountains, and not in the Caverns in the lower Parts of the Mountains. Monſ. *de Buffon* ſays, that Earthquakes are moſt frequent where there are *Volcano's*; ſulphureous Matter abounding moſt there: But that, tho' they continue burning long, yet they are not very extenſive. But that the other Sort of Earthquakes, which are not cauſed by a *Volcano*, extend often to a great Diſtance. Theſe are much longer Eaſt and Weſt, than broad North and South; and ſhake a Zone of Earth with different Degrees of Force in different Parts of their Courſe; *viz.* in proportion to the different Quantities of exploſive ſulphureous Matter in different Places. Theſe kind of Earthquakes are obſerved to be progreſſive, and to take Time to extend to the great Diſtances ſometimes of ſome Thouſands of Miles. They are an inſtantaneous Exploſion in every Place, near the Surface of the Earth; and therefore do not produce Mountains and Iſlands, as *Volcano's* ſometimes do.

The Earthquake in *London*, *March* 8. was thought to move from Eaſtward to Weſtward. M. *Buffon* mentions an Earthquake at *Smyrna*, in the Year 1688. which moved from Weſt to Eaſt; *viz.* becauſe the firſt Kindling probably began on the Weſtern Side; and in the Earthquake at *London* on

the Eaſtern Side. And accordingly it was obſerved, that the reddiſh Bows in the Air, which appeared ſeveral Days before that Earthquake, aroſe in the Eaſt, and proceeded Weſtward. It was obſerved, after the Earthquake at *Smyrna*, that the Caſtle-Walls, which run from Eaſt to Weſt, were thrown down; but thoſe from North to South ſtood; and that the Houſes on Rocks ſtood better than thoſe on the Earth.

M. *de Buffon* relates, that the Vibrations of the Earth, in Earthquakes, have commonly been from North to South; as appears by the Motion of the Lamps in Churches: Which makes it probable, that, tho' the Progreſs of the Earthquake at *Smyrna* was from Weſt to Eaſt, yet the Vibrations of the Earth might be from North to South; and thereby occaſion the Falling of the Caſtle-Walls, which run from Eaſt to Weſt, but not thoſe which run from North to South. A probable Argument, that, as the freeſt Paſſage, ſo the greateſt Exploſions were made in the Clefts of the Earth which run Eaſt and Weſt; which would make the Vibrations North and South.

It was obſerved, that the Waters turned foul the Day before an Earthquake at *Bologna* in *Italy*: And I was informed, that the Water of ſome Wells in *London* turned foul at the time of the Earthquakes. Which was probably occaſion'd by the Aſcent of great Plenty of ſulphureous Vapours thro' the Earth.

As to the hollow rumbling Noiſe, which is uſually heard in Earthquakes, it ſeems not improbable, that it may be occaſion'd by the great Agitation that the electrical æthereal Fluid is put into by ſo great a Shock of a large Maſs of Earth. For, if the like Motion of a ſmall

a ſmall revolving glaſs Globe can excite it to the Velocity of Lightning, and that with a Force ſufficient to kill Animals, how much greater Agitation may it probably be excited to, by the exploſive Force of an Earthquake!

The Exploſion of a Cannon in *St. James's Park* is obſerved to electrify the Glaſs of the Windows of the *Treaſury*. And what makes it ſtill more probable, is, the Analogy that there is between them in other reſpects. For, as the electrical Flaſh ruſhes, with the Velocity of Lightning, along the moſt ſolid Bodies, as Iron, *&c.* and as I have ſeen it run only on the irregular Gilding of Leather; ſo ſuch ſolid Bodies are obſerved to be the Conductors of aereal Lightning, which rends Oaks in Pieces, and has been known to run along and melt an iron Bell-Wire on two Sides of a Room, *&c.* And accordingly it was obſerved, in the great Earthquake in *Jamaica*, that the moſt tremendous Roaring was in the rocky Mountains. And in the late Earthquake of *March* 8. in *London*, the loudeſt Exploſions were thought to be heard near ſuch large Stone Buildings as Churches, with lofty Steeples and Spires.

I, who lay in *Duke's-Court*, near *St. Martin's* Church, and was awake all the Time of the Earthquake, plainly heard a loud Exploſion up in the Air, like that of a ſmall Cannon: Which made me conjecture, that the Noiſe was owing to the Ruſhing off, and ſudden Expanſion, of the electrical Fluid, at the Top of *St. Martin's* Spire; where all the electrical *Effluvia*, which aſcended up along the larger Body of the Tower, being by Attraction ſtrongly condenſed, and accelerated at the Point of the Weather-

cock,

cock, as they ruſhed off, made ſo much the louder expanſive Exploſion.

XXXV.

The Preſident's *Report of the Account given him by* Tho. Burrat, *of* Kenſington, *concerning the* Earthquake *on* March 8. *laſt paſt.*

Read April 26. 1750. ON *Tueſday* the 24th of this preſent *April* 1750. Mr. *Thomas Burrat*, of *Kenſington*, a Husbandman, and Bailiff to the Right Honourable *Henry Fox* Eſq; of *Holland-Houſe*, gave me the following Account:

That, being early about his Buſineſs in the Grounds about a Quarter of a Mile from the ſaid Houſe, on *Thurſday* the 8th Day of *March* laſt, as he was going to tell his Sheep (which he does every Morning, and which were then lying down on a dry ſloping Piece of Ground), he heard, as he thought, about a Quarter after Five a Clock, a Noiſe, much like Thunder at a Diſtance; which coming, to his Apprehenſion, from the North-Weſt, continued ſome ſmall time, growing louder as it came nearer him, and gave a Crack (ſo he expreſſed himſelf) over his Head; and then went off in the ſame manner it came on towards the South-Eaſt.

He ſaid, that the Sky was, to his thinking, quite clear, and without any Cloud; and that he ſaw neither Lightning, nor any Appearance of Fire; but that, immediately after the Crack, he found the

Ground to ſhake under him; and that he even ſaw it move where he was (tho' as dry and ſound a Spot as any he knows) like a Quagmire or Quickſand; inſomuch that he could not help being apprehenſive, that it would have opened, and taken him in.

He ſays, that the Sheep he was beginning to tell all ſtarted up at once, as frighted, and preſently began to run, as if purſued by ſomewhat they were apprehenſive of. He ſaid further, that he took notice, that ſeveral Crows, which were at Rooſt upon ſome Trees not far off, all at the ſame Inſtant flew away, making the ſame Noiſe they conſtantly make when they are affrighted at the Diſcovery of a Bird of Prey, or any other Enemy; and that the Trees themſelves very ſenſibly trembled and ſhook.

The Noiſe he heard began a ſenſible time before the Shake of the Earth; and he judges that the whole Matter laſted better than a Minute.

He firſt expreſſed himſelf about the Direction of the Noiſe he heard in the Manner juſt above related; and, being asked again concerning that Particular, he explained himſelf by ſaying, that, to his thinking, it came on from between *Hillington* and *Harrow on the Hill*, and went off over *Deptford:* Which may be obſerved to be very agreeable to his other Deſcription.

Mr. *Bird*, the eminent Mathematical Inſtrument-maker in the *Strand*, told me alſo the ſame Day, that he heard, at his Houſe, a Noiſe, like the Diſcharge of a Cannon at ſome Diſtance, juſt before the Earthquake; and that his Bed, in which he then was, was very ſenſibly rocked from right to left twice: And that he is well aſſured the Feet of the

Bed were actually lifted up from the Floor, during the Motion; as he was very ſenſible, by the Noiſe they made when they came to the Floor again, 4 times in all, twice to his right Hand, and as often to his left Hand.

XXXVI.

Extract of a Letter from Cheſter, *concerning an* Earthquake *felt there* April 2. 1750. *communicated by* Robert Paul *Eſq*; *F. R. S.*

Read May 3. 1750. I CAN'T help informing you (as it is a Matter of Concern to every one) that, on *Monday* Night laſt, about 10 o' Clock, we felt in this City a Shock of an Earthquake. It was ſenſibly felt by all or moſt of the Inhabitants. A few Bricks were ſhook off a Chimney in *Foreſt-ſtreet*; ſeveral Houſe-bells were rung; the Centinel at the Caſtle was ſhook off his Seat in the Centry-box; the Houſes all over the Town were ſhaken, and the People terribly frighten'd and alarm'd. It has been felt for ſome Miles round the Town, particularly at *Barn-Hill*, where the Houſes were greatly ſhaken. We are in great Fears of another more violent.

XXXVII.

A Letter from the Rev. Stephen Hales *D D. & F. R. S. to the* Preſident, *ſerving to incloſe a Letter to him from* Walter Bowman *Eſq; concerning an* Earthquake *felt at* Eaſt Moleſey *in* Surry, *on* March 14. 1749-50.

SIR, *Teddington, April* 11. 1750.

Read May 3. 1750. I HAVE here incloſed a Letter from my Neighbour Mr. *Bowman*, at *Moleſey*, near *Hampton-Court*; whoſe Veracity and Abilities to make the proper Obſervations, I can depend on. I well remember the extraordinary Redneſs, *&c.* in the Sky the Evening before, which he mentions. The Shock which he felt in a Chair, was, as I gueſs, in *Italy*; he having travell'd much abroad. I am,

SIR,

Your obliged humble Servant,

Stephen Hales.

Reverend Sir, *Eaſt Moleſey, April* 8. 1750.

BEING informed that you have made ſome Obſervations on the late Earthquakes, as of late I have not been at leiſure to wait on you, I take this Opportunity of informing you, that the third Shock

Shock in theſe Parts is paſt ſome Weeks ago: So that the fearful Expectations, which have unmann'd the daſtardly *Londoners*, have no other Foundation than this, that, in all Events, *Engliſhmen* are ſtill after the Fair.

The AUTHOR of NATURE, for our Sins, may alarm us with a fourth, and four hundred more, if His Wiſdom pleaſes; but, as to a third, ſo little do our guilty Conſciences, or viſionary Monitors, know of the Matter, that Providence has prevented the Fears of the one, and antedated the Predictions of the other. For, without any regular Connexion with the Moon, it happen'd about 7 Days after the ſecond Shock, on the 14th of *March*, I believe, before 4 o' Clock in the Morning; when full awake, I felt my Houſe, for a Second or two, ſhake, like a Spaniel juſt come out of Water. My Bell on the Stair-caſe rung only one Twitch. I roſe, look'd out, and ſaw the Moon ſhine bright, without one Cloud, or one Breath of Wind; and, finding none of my Servants diſturb'd, I return'd to ſound and quiet Sleep.

It was exactly of the ſame Nature with the ſecond Shock, a Shudder of the Houſe from Top to Bottom; ſo that I neither miſtook the one nor the other for an Exploſion of Mr. *Norman*'s Horſe-Powder-Mills, wherein, you know, he never works above 40 Pounds at a time. Here I felt nothing like an Exploſion, but a Concuſſion, which any Man may conceive, from his Hand ſhaking a Bed upon Caſters, if we may compare great things to ſmall. Nor can I deſcribe the ſecond Shock, felt alſo in Bed, compared with this third, otherwiſe than by the

the Shudder of a Horſe after ſwimming, more ſtrong than that of a Dog; while the ſame Bell ſounded all in Confuſion, as if it had been pack'd and toſs'd in a Hamper.

The 13th of *March*, in the Evening about Sunſet, the Sky was dreadfully charged with a deep Purple mixed with Red, which, from the Weſt, tinged the Clouds by the South quite to the Eaſt; and was ſucceeded by a clear effulgent Crimſon or Pink-Colour, luminous, as deep, as ever Eye pierced into the azure Blue.

I neither have met with, nor heard of, any Perſon, who felt this ſecond Shake which I have deſcribed. But, if any Memorials are to be preſerved of theſe ſeveral Shocks, all which I have felt moſt diſtinctly, I think this ought not to be forgot; becauſe I do not apprehend it to have been ſtrong enough to have waked any Perſon, nor to alarm even any one awake in Bed. And as for thoſe who were up, and on foot, I do not think they could have perceived it, if I may judge by ſuch a one, which I once felt by a ſingle Start of my Chair, without knowing what it was, till I compar'd Notes with my more experienc'd Neighbours.

To conclude, this ought not to exempt us from Fear, but to awaken our Truſt in PROVIDENCE; ſince Nature works, and few perceive it; and when ſhe works, whom ſhe has a Mind to ſave are ſafe, and thoſe ſhe intends to deſtroy cannot eſcape. Within ourſelves we find Strength or Weakneſs to bear her extraordinary Touches; but to fly from them, even an Immortal cannot; ſince her Hand reaches over

all

all the viſible and inviſible World. Reverend Sir, I am,

Your ſincere Friend, and

moſt obedient Servant,

Walter Bowman.

XXXVIII.

Abſtract of a Letter from Mr. Pennant *to* Rich. Holford *Eſq*; *Maſter in* Chancery, *of an* Earthquake *felt in* Flintſhire, *on* April 2. 1750.

Downing, near Holywell in Flintſhire, April 3. 1750.

Read May 10. 1749.

LAST Night we were greatly alarm'd with a violent Shock of an Earthquake between 10 and 11 o' Clock. I, who was in Bed, was frequently moved up and down; and the Bed, having Caſters, was removed ſome ſmall Space from its proper Situation.

During the Shock, a great Noiſe was heard in the Air; and, ſome Nights before, Lights were ſeen in the Sky; ſuch as were previous to the Earthquake in Town.

Thanks to Providence, no further Miſchief has happen'd, than the Terror this unuſual *Phænomenon* occaſion'd in our Family.

This Place is about two Miles from the Sea.

XXXIX.

XXXIX.

The Poſtſcript of a Letter from Mr. Nath. Downe *to the Hon. Mr.* Greenville, *concerning an* Earthquake *felt at* Bridport, *on* March 18. 1749-50.

SIR, *Bridport, March* 19. 1749.

Read May 10. 1750. YESTERDAY Morning the Sun ſhone very bright; which, between 11 and 12, was with thick dark Clouds ſo obſcured, as render'd it darker than common. Soon after, a violent Clap of Thunder, and a heavy Shower of Hail, ſucceeded: After which it grew again ſerene; and in the Evening about 6, a Shock of an Earthquake was felt in this Town, and the neigbouring Villages, with (thro' Mercy) no other Damage than a great Surprize to all who felt it. I am,

SIR,

Your moſt obedient, and

very humble Servant,

Nath. Downe.

XL.

XL.

Mr. Henry Baker *F. R. S. to the* Preſident, *concerning an* Earthquake *felt at* Winbourn *in* Dorſetſhire, May 4. 1749. *and of another at* Taunton *in* Somerſetſhire, July 1. 1747.

SIR,

Read May 17. 1750. AS the two remarkable Shocks of an Earthquake, lately felt at *London*, may probably excite a Curioſity of knowing what of the ſame kind has happen'd in other Parts of the Kingdom within theſe few Years, I wrote, about a Week ago, to a Siſter of my Wife, who lives at *Winbourne* in *Dorſetſhire*, deſiring her to ſend me the beſt Account ſhe could collect, of an Earthquake, which, in one of her Letters ſome Months ago, ſhe had mention'd to have felt herſelf at that Place, in the Month of *May* laſt Year; and the Subſtance of her Anſwer is as follows:

She ſays, that, on the 4th Day of *May* 1749. about 10 o' Clock in the Morning, ſhe was ſtanding at one of the Windows in her Chamber, her Son (a Boy about 9 Years old) was ſitting on a Bed in the Middle of the Room, and her Siſter was in another Chamber two Rooms from her, all on the ſame Floor; when they heard a ſudden Blow (ſo ſhe expreſſes it) that ſeem'd to be very near, which ſhook the Houſe ſo much, that the Windows rattled, and the Floor ſhook very much.

and frighted her to ſuch a Degree, that ſhe cried out, Lord have Mercy upon me, what is that? Suppoſing it had been a Burſt of Thunder. Then looking out, the Sky was very clear, without any Cloud near at hand; but there ſeemed to be a heavy Cloud hovering at a Diſtance, whence ſhe and her Siſter imagined the Shock came; for they had then no Thought of an Earthquake.

There was, ſhe ſays, but one Blow, with a Noiſe very loud, like the Diſcharge of a Cannon; which made her ſend to inquire if there were any Powder-Mills in that Part of the Country, but was aſſured there were none. Her Husband (Mr. *Boſton*) was then at a Place called *Caſhmoor*, on the *London* Road, 6 Miles from *Blandford*, and about 8 from *Winbourne*, where he heard it in much the ſame manner. Their next Neighbour was at the ſame time 12 Miles diſtant, and heard it there; and every body ſaid it was an Earthquake.

It was heard at *Shapeck*, about 4 Miles from *Winbourne*; and at a Place called *Eaſtbrook*, about half a Mile from *Winbourne*, the People ſay it threw the Pewter off the Shelves. She ſays, I may depend upon it as a Truth, that it was heard 20 Miles round *Winbourne*; and adds, that People were very much frighted, but no Harm was done.

I had, Sir, the Honour, two Years ago, to lay before you an Account of an Earthquake felt at *Taunton* in *Somerſetſhire*, and for 40 Miles in Length as well as Breadth, on the 1ſt Day of *July*, in the Year 1747. which was communicated to me by the Rev. Mr. *John Forſter*, who happen'd at that time

to be there by Accident. It was likewiſe by mere Accident I came to the Knowlege of what I have juſt now been deſcribing: Which induces me to imagine, that Shocks of this kind may poſſibly happen more frequently than is commonly ſuppoſed, tho' we hear nothing of them: For, in Country Places, People are ſo little attentive to ſuch Matters, that, unleſs ſome conſiderable Miſchief be done, they mind them very little at the time, and, as ſoon as over, think no more about them.

I have the Honour to be, with all poſſible Reſpect,

SIR,

Catherine-ſtreet, May 10. 1750. *Your moſt obedient Servant,*

H. Baker.

XLI.

Part of a Letter from M. de Reaumur *F. R. S. to the* Preſident, *concerning an* Earthquake *felt in* France, October 11. 1749.

Paris, April 23. 1750.

Read May 17. 1750. ON *Saturday*, the 11th of *October* 1749. about 7 in the Evening, there was an Earthquake in *France*, which, according to my own Inquiries, reached one Way above 60 Leagues in Extent, from our Coaſt of *Poicton* beyond *Luçon*, as far as the Neighbourhood of *Blois*.

I was then at my own Houſe at *Reaumur*, and ſitting in a Cloſet on the Ground-Floor, where I had only notice of it by a Noiſe like to the Rattling of a Coach over a rough uneven Pavement, which ſeem'd to grow ſtronger, as at different Fits, for about a Minute and a half. I went out of my Cloſet to inquire what others might have felt, as I had not been at all ſhocked myſelf, in other Parts of the Houſe; and I met with ſome Ladies juſt come in a Fright from the Apartments up one Pair of Stairs; and a learned Father of the *Oratoire* that was with me, and was juſt then run down, upon its ſhaking, from a Turret, on the Top of the Houſe, the Motion of which had very much ſurpriſed him.

In the Village ſeveral People alſo felt the Shake; but others, that happened to be employed, were not ſenſible of it. I was informed, that, in ſome other Villages and Country-Towns, it was more conſiderable than where I was; but I did not hear that it did any-where any Miſchief worth ſpeaking of.

XLII.

The Rev. Mr. Wm. Barlow *to the* Preſident, *concerning a Shock of an* Earthquake *felt at* Plymouth, *about One o' Clock in the Morning, between the 8th and 9th of* Feb. 1749-50.

SIR,

Read May 24. 1750. IT is proper to obſerve, that the following Relations are not made by mean, ignorant, or fanciful People, but by Perſons of good

2 Senſe,

Senſe, whoſe Veracity is unqueſtionable, and whoſe Judgment in this Caſe is, I think, rational and juſt.

Wm. Barlow.

The Earthquake at *London* was on *Thurſday, February* 8. about Noon.

The Declaration of the Hon. Philip Vanbrugh *Eſq; Commiſſioner of His Majeſty's Dock-Yard near* Plimouth, Devon.

THAT, in the Night, betwixt *Thurſday* the 8th Day of *February* 1749. and the Day following, towards One o' Clock, as he was reading in Bed, he was ſenſibly affected by a ſudden Shake: That, looking about, he obſerved, betwixt the Foot-Curtains, which were partly open, ſome Drawings which hung on the Wall, alſo the Side-Curtains, in a trembling Motion: That it immediately brought into his Mind the Earthquake in *Jamaica* in 1692. which ſeveral Years ago had been, at *Jamaica*, particularly deſcribed to him, by a Perſon who was in the Iſland at the time of that Earthquake.

March 12. 1749.

Ph. Vanbrugh.

The Declaration of Mrs. Vanbrugh, *Siſter of the Commiſſioner, living in the ſame Houſe.*

THAT, the Night above-mention'd, at what Hour ſhe cannot ſay, ſhe was greatly ſurpriſed by an unuſual Motion of her Bed; which immediately brought

brought to her Thoughts the Shock of an Earthquake ſhe felt ſeveral Years before, to which in her Mind ſhe reſembled the preſent Shake.

March 12. 1749.

Victoria Vanbrugh.

The Declaration of Mrs. Slade, *Daughter of Mr.* Slade, *Maſter-Shipwright of His Majeſty's Dock-Yard*, Devon.

THAT, in the Night above-mention'd, towards One o' Clock, ſhe perceiv'd a ſenſible Motion of her Bed, and (there being a Light in the Room) ſaw the Curtains ſhake. This ſhe thought to be occaſion'd by the Wind (which ſhe then heard blow ſtrong), ſuppoſing the Saſh not to be cloſe down: Accordingly ſhe roſe, and went to the Windows, but found the Saſhes intirely cloſe.

March 12. 1749.

Elizabeth Slade.

N. B. Both the Commiſſioner and the Ladies believe there was only a ſingle Shake. Miſs *Slade's* Houſe joins the Commiſſioners.

On account of the dead Time of the Night in which it happen'd, not many People would be ſenſible of the Motion: Of thoſe who were, moſt would naturally attribute it to the high Wind, which then blew; and a Month being paſs'd before any Inquiry has been made, it is not to be wonder'd at that, but few recollect any thing concerning it.

The

The Commiſſioner, by reaſon of frequent Returns of the Gout, does not ſleep up-ſtairs, but in a very ſmall Room behind the Houſe, joining to the Houſe, and communicating by a Door with one of the back Parlours. This Building is ſo low (being only a Ground-floor, without any Room over it), and is ſo skreen'd by higher Buildings, that hardly any Wind can affect it; eſpecially the Wind which blew that Night; as the Body of the Commiſſioner's Houſe was betwixt that and the Stroke of the Wind.

The Dock is about two Miles Weſt from *Plymouth*, and about 220 almoſt Weſt from *London*.

XLIII.

A Letter from Mr. Ph. Warburton *to the* Preſident, *ſerving to incloſe an Extract of a Letter from the Rev. Mr.* John Seddon, *of* Warrington *in* Lancaſhire, *to Mr.* Jo. Philpot, *in* Cheſter, *concerning an* Earthquake, April 2. 1750.

Dear Sir, *Grange in Cheſhire, June* 10. 1750.

Read June 14. 1750. THE incloſed Extract is the only written Account of the late Earthquake which I can obtain from any of the Naturaliſts in this Country: And as I have converſed with ſeveral intelligent Perſons who perceived it, the incloſed Extract correſponds very exactly with their Sentiments and Obſervations upon it. I have now in my Cuſtody

tody the original Letter from Mr. *Seddon* to Mr. *Philpot*; and ſhall not part with it without your Direction.

I am, Sir, with the greateſt Reſpect,

Your moſt humble Servant,

Ph. Warburton.

Extract of a Letter from the Rev. Mr. J. Seddon, *of* Warrington *in* Lancaſhire, *to Mr.* John Philpot *in* Cheſter, *dated* Warrington, May 10. 1750.

THE late Earthquake happen'd the 2d of *April*, at 10 at Night, as nearly as can be determin'd; if any thing, rather after than before. I was at *Liverpoole* at that time, where the Shock was not ſo ſenſible as at ſome other Places; and yet a Perſon in Company with us that had lived in *Jamaica* a great Number of Years, and well acquainted with Motions of this kind, having felt eleven in one Night, declared it to be the ſmarteſt he ever felt. The Duration of the Motion was every-where extremely ſhort, not exceeding, as nearly as I can gueſs, 2 or 3 Seconds of Time.

As to the Nature of the Motion, as far as I can judge of it myſelf, and from the Obſervations of others, it ſeems to have been of the horizontal kind, proceeding in an undulating manner from North-Weſt to South-Eaſt. I was in a ſitting Poſture, and the Motion I felt was like that of a Veſſel falling from the Top of a Wave, and riſing again upon the next. Mr. *Breckell* of *Liverpool*, and others that I have convers'd with upon the Subject, repreſent it in the ſame Way.

It

It is, I think, univerſally agreed, that an uncommon Noiſe attended the Shock, a Noiſe that much reſembled diſtant Thunder, or a hollow rumbling Wind: Some Perſons alſo ſay, that they perceived a ſultry ſulphureous Smell, much about the Time of the Shock; tho' that Day and Evening were remarkably cold; and whether this was real, or only imaginary, I cannot determine.

The Shock was felt as far North as *Lancaſter*, and as far to the South as *Wrexam*, and the adjacent Parts; in all, about 70 Miles N and S. It was felt as far as *Stockport* and *Altringham* to the Eaſt, and quite into *Flintſhire* on the Weſt; that is, about 30 or 40 Miles Eaſt and Weſt.

The Shock was not ſo great, or of ſo long Continuance, as to do any material Damage. I think I heard of a large *China* Jar falling from a Chimney-Piece in a Gentleman's Houſe, of a Piece of Marble reared againſt a Wall falling and breaking, and two or three trifling Inſtances of that kind. There is only one thing further that I would mention upon the Occaſion: As ſoon as I felt the Shock, I was immediately apprehenſive what it was, and went out to ſee whether there was any thing remarkable in the Atmoſphere. I then obſerv'd a very uncommon Appearance; *viz.* an infinite Number of Rays, proceeding from all Parts of the Heavens, converged to one Point; no luminous Body appeared at all. The Rays were at firſt of a bright Yellow; afterwards they became blood-red. This *Phænomenon* was not far from our *Zenith*. It continued about 20 Minutes, and then diſappeared.

The enſuing Night was very ſtormy; a large Quantity of Hail fell about Two in the Morning; and the Barometer was extremely low.

Thoſe are the principal Circumſtances that I am acquainted with, relating to the late Earthquake. I depend upon your Candour and Goodneſs to excuſe the looſe manner in which they are thrown together.

XLIV.

Mr. Henry Baker *F. R. S. to the* Preſident, *containing an Extract of a Letter from Mr.* W. Arderon *F. R. S. concerning an* Exploſion *in the* Air, *heard at* Norwich, June 7. 1750.

SIR,

Read June 15. 1750. MR. *Arderon* writes me Word from *Norwich*, that, on *Thurſday* laſt, the 7th inſtant, as he and a Friend were walking to take the Air, a little to the Weſtward of that City, they heard, about 7 o' Clock in the Evening, a kind of hollow Noiſe, as loud as that of a large Cannon. Which Noiſe was once repeated nigh the ſame Place as an Echo, and then continued dying as it were away for about half a Minute.

They ſaw no Lightning, nor any Clouds, except a few thin whitiſh ones in the Weſtern Horizon.

It was heard, he ſays, by great Numbers of People in the City of *Norwich*, notwithſtanding the continual

continual Noiſe and Hurry there: He likewiſe received Accounts of it from *Swanthorpe*, 6 Miles S W; and from *Racka*, 4 Miles N E of that City, agreeing with the above Deſcription.

He has not heard that any Perſon obſerved any Tremor of the Earth; and confeſſes his own Surprize was ſo great, he does not know whether there was or not.

Mr. *Wilſon*, a Gentleman who was with him, thought the Noiſe much reſembled the Fall of a great Building; and a Gentleman at *Norwich* deſcribed it like a large Weight falling down upon a Chamber-floor over his Head.

I received the above Account laſt *Monday*; and as this Year has been productive of many unuſual *Phænomena*, I hope you will excuſe my laying this before you amongſt the reſt. I am,

SIR,

Your moſt obedient Servant,

H. Baker.

Catherine-Street,
June 14. 1750.

XLV.

An Account of Part of a Roof *of a* Pot-houſe *at* Lambeth *being flung down by the* Earthquake, March 8. 1749-50. *communicated by Mr.* Wm. Jackſon, *Potter, to* C. Mortimer, *M.D. Secr. R. S.*

Read June 21. 1750. AT a Pot-houſe belonging to Mr. *Oad* in *Gravel-Lane*, a large Part of the Roof, containing near two Square, was intirely thrown down by the laſt Earthquake, *March* 8. 1750. and ſeveral Fiſhermen, then at Work, imagined a Porpoiſe, or ſome other large Fiſh, had riſen under their Boat.

XLVI.

Extract of Letter a from Dr. Mackenzie *to Dr.* Mead *F. R. S. concerning* Earthquakes *at* Smyrna.

Conſtantinople, May 23. 1750.

Read July 5. 1750. I Obſerve, Sir, in Mr. *Touchit's* Journal, that a certain ingenious Gentleman would not allow the laſt Shock of an Earthquake in *London* to be an Earthquake, becauſe it was not central; but rather calls it an Airquake, becauſe it was lateral. I have felt many Shocks, ſince I have been in this Country; particularly in *Smyrna* 1739. when,

when, after the great Shock upon the 24th of *March*, there were ſome Shocks every Day for a Month; ſo that few or none went into Houſes before the latter End of *April:* When I had time enough to obſerve their Motion, which was regularly periodic, or about the ſame Hour every Day. But I muſt differ from this unknown Gentleman's Opinion ſo far as to ſay, that every one of thoſe Shocks was lateral, moving from the South to the North; and, as near as I could judge, the Motions formed acute Angles, ſomewhat reſembling the Motion of Lightning.

Mordach Mackenzie.

XLVII.

Part of a Letter from William Folkes, *Eſq; F. R. S. to his Brother the* Preſident, *concerning a Shock of an* Earthquake *felt at* Newton *in* Northamptonſhire, *on* Sunday, September 30. 1750.

Dear Brother,

Read Oct. 25. 1750. ON *Sunday* laſt, rather before One, whilſt we were at Church, we had an Earthquake here. The Noiſe, to the beſt of my Judgment, continued near a Minute; but was not ſo loud as either of thoſe I heard at *London.* Several of the Congregation perceived the Ground tremble; but I cannot ſay I did. It is ſaid to have been more violent in ſeveral Places in the Neighbourhood than here; but this I much queſtion. Alſo the Day

Iwent

I went thro' *Stamford* to *Grantham*, in my Way to *Yorkſhire*, an Earthquake was felt in both thoſe Places: So that I have been within the Knowlege of no leſs than Four of theſe Shocks of Nature in Eight Months time; but, thank God, none of them attended with any ill Conſequences, any farther than furniſhing Room for melancholy Reflections upon ſuch a diſagreeable Alteration in our Climate, which had been generally thought before tolerably free from this Calamity. ———

Believe me to be, with moſt ſincere Love and Eſteem,

Dear Brother,
Your moſt faithful,
and obedient humble Servant,
W. Folkes.

XLVIII.

Part of a Letter from James Burrow, *Eſq; F. R. S. to the* Preſident, *concerning an* Earthquake *felt near* Bury St. Edmund's *in* Suffolk, *and another at* Narborough *in* Leiceſterſhire, *on the* 30*th of* September, 1750.

Bury St. Edmund's, 2d October, 1750.

Dear Sir,

Read Oct. 25. 1750. THIS Morning I have been making a Viſit at Lord *Cornwallis*'s at *Culford*; which, I ſuppoſe, I need not tell you, is about four Miles from *Bury* in *Suffolk*. Lady *Cornwallis* (whoſe

(whoſe Judgment and Accuracy are ſuperior to all Doubt or Exception, and her Veracity ſtill more ſo), aſſured me, That on *Sunday* laſt, about One o'Clock, as ſhe was ſitting and reading in her Dreſſing-room at *Culford*, ſhe ſuddenly felt and ſaw her Chair and Perſon move backwards and forwards; ſo that ſhe ſearched and examined whether any Dog had got under her Feet and Chair, or any one entered her Chamber unperceived; but found herſelf abſolutely alone in the Room: Whereupon ſhe tried, whether, by laying her Hand or Elbow upon the Table, ſhe could repeat the ſame Motion, or any thing like it; but could not. She added, that ſhe felt herſelf a good deal ſurpriſed at this extraordinary Senſation, at the Inſtant of perceiving it: But neither then, nor afterwards, had the leaſt Imagination about an Earthquake; till, upon coming down to Dinner, ſhe was asked by Miſs *Charlotte Cornwallis*, her Second Daughter, a young Lady grown up, "Whether ſhe "had not felt the Earthquake?" Miſs *Charlotte* agreed to the Time; and was herſelf alſo ſitting and reading in her own Dreſſing-room, which was one Pair of Stairs higher than her Ladyſhip's, yet on the ſame Side of the Houſe. However, it was alſo felt by Miſs *Charlotte Cornwallis*'s Maid-Servant, whoſe Chamber was in a different Part of the Houſe, and diſtant from either of the Ladies Apartments; and who was ſo alarmed at it, as to leave her Room, and come into her young Lady's, to ſee what was the Matter. No one elſe in the Houſe perceived it. But Lady *Cornwallis* ſays, that, as far as ſhe can learn, they were all upon their Feet; none being ſitting, except the three already mentioned.

The

The Houſe ſtands alone in the Park: And Lady *Cornwallis* had declined making any Inquiry amongſt the Inhabitants of the adjacent Village; partly, for fear of alarming them with Apprehenſions of Danger, of which they would be very ſuſceptible from the Name of an Earthquake; and partly from the little Hopes ſhe could have of procuring any tolerably accurate Account of the Fact from ſuch Reporters.

As you have been ſo careful and exact in collecting the ſeveral Hiſtories of thoſe various Shocks, which have been felt in diverſe Parts of the Kingdom within theſe nine Months laſt paſt, it will not be unacceptable, I hope, to furniſh you with this Supplement to them; eſpecially as none of the former have (as far as I remember) affected theſe Parts.

P. S.

Great Finborough-Hall, *near* Stowmarket, Suffolk,
Sunday, 7*th* October, 1750.

Dear Sir,

On our Return hither to Mr. *Wollaſton*'s, we found a Letter from a worthy Friend of Mr. *Wollaſton*'s and mine, Mr. *Metcalfe*, a Clergyman of Reputation, Senſe, and Fortune; who reſides at *Leiceſter*, and has two Livings near that Place; one at *Narborough*, the other at *Tilton*: Out of which I will tranſcribe a Paragraph, which will ſerve to confirm Lady *Cornwallis*'s Relation.

" Yeſterday [It is dated *Leiceſter, Oct.* 1. 1750.], " about Noon, we were all greatly alarmed with a " very great Shock of an Earthquake. I was in the " Pulpit at *Narborough*; where the whole Church " ſhook with ſuch Violence, that the Congregation " expected

" expected that the Roof was falling in, and run " out of the Church immediately, leaving the poor " Parſon to ſhift for himſelf. I ſtood my Ground; " and, by calling to them, and aſſuring them there " was no Harm, prevail'd on them to return, and " make an End of the Duty: But it was with Fear " and Trembling. It was felt pretty much at *Lei-* " *ceſter*; but how much further, I have not heard."

Since the Receipt of the above Letter, I have read, in the public News-papers, an Account of its having been alſo felt at *Northampton* about the ſame time.

So that no Doubt can remain of the Shock which Lady *Cornwallis* perceived at *Culford*, having been a real Earthquake.

XLIX.

A Letter from the Rev. Mr. John Nixon, *F. R. S. to Mr.* John Ward, *F. R. S. and* Rhet. Prof. Greſham. *ſerving to accompany two Letters; one from Sir* Thomas Cave, *Bart. and another from the Miniſter of* Weſton with Sutton *in* Northamptonſhire; *concerning the* Earthquake *on* Sept. 30. 1750.

Dear Sir, Higham, *near* Towceſter, Northamptonſhire, Oct. 8. 1750.

Read, Oct. 25, 1750. I Beg leave to ſend you ſome Memoirs relating to the Earthquake, which happened in theſe Parts on *Sunday* Se'nnight, *viz.*

September 30. the one is a Letter from Sir *Thomas Cave*, Baronet, of *Stanford* near *Lutterworth* in *Leiceſterſhire*, a Gentleman of good Senſe, and unqueſtionable Veracity. The other is a Paragraph taken from the *Northampton Mercury* of this Day. As for my own Part, being engaged at Church in a very ſolemn Part of our Worſhip, I only remember to have heard a loud Exploſion, like that of Thunder; but my Neighbours aſſur'd me, they perceiv'd the Windows to ſhake and jar. I believe it was more violent in other Parts of our County, and the Counties adjacent; but I am cautious of tranſmitting any Accounts, but ſuch as I think may be depended upon. My Compliments to all Friends conclude me,

SIR,

Your moſt obedient, &c.

J. Nixon.

Dear Sir, *Stanford-Hall, Oct.* 5. 1750.

I AM much obliged to you for your kind Participation in my preſent Concern, which, I thank God, is, within theſe few Days, much diminiſh'd; my Wife being now better.

We were amazed at half an Hour after 12 on *Sunday* by a violent Shock of an Earthquake while we were at Church; it laſted between 3 and 4 Minutes, and was attended with a prodigious rolling Noiſe, louder than all the Thunder I ever heard in my Life, was it collected into one Exploſion.

Thank

Thank God, no Damage accrued to any of us, beyond the Confuſion it occaſion'd. I am

Your moſt humble Servant,

Tho. Cave.

Northampton, Oct. 8.

ON *Sunday* the 30th of laſt Month, about three Quarters after 12 at Noon, a Shock of an Earthquake was felt in this Town, and in the Country round us for many Miles; but was not thought to be ſo violent as thoſe which happened at *London* at the Beginning of the Year. People who were ſitting in the Churches, or in their Houſes, were moſt ſenſible of it, but thoſe who were walking were not ſo much affected; and many conſider'd it at firſt only as the Noiſe of a ſudden Guſt of Wind, or the remote Running of a Coach or Chair. We don't hear of any Damage done thereby.

The following is a Letter from the Reverend the Miniſter of Weſton with Sutton, *in the County of* Northampton, *dated* Oct. 2. 1750.

ON *Sunday* the 30th of *September* laſt, at *Aſhley*, in this Neighbourhood, about a Quarter before One o' Clock, whilſt they were ſinging after Sermon, the whole Congregation was flung into the utmoſt Conſternation, by a very terrible Shock of an Earthquake; the Singers could ſcarce perſuade themſelves to finiſh their Anthem. The Read-

ing-Desk ſtands juſt by the Singing-Pew; and I really thought that Part of the Church betwixt the Chancel and the Pillar next to it would have ſunk into the Earth, with a loud and dreadful Noiſe from a ſort of ſubterraneous Exploſion, or whatever the Learned and Curious will term it. After that awful Noiſe, and ſomething far exceeding a common Tremor, it kept rolling on ſeemingly from North to South, with an hollow Rumbling, like Thunder at a Diſtance. This uncommon Shock, I find, upon Inquiry, was felt in all the neighbouring Towns in *Leiceſterſhire*, as well as in this County; and very likely we ſhall hear that many Parts of the Iſland were affected by it.

May the Inhabitants, at leaſt, from the higheſt to the loweſt, look upon theſe as ſo many tremendous Warnings, as the ſure Indexes of God's Diſpleaſure with the Degeneracy, the Luxury, the Prophaneneſs, and unhappy Diviſions of the Nation. To pretend to flee for Safety and Protection from the City to the Country, or from one Part of the Country to another, is degrading Chriſtianity to Heatheniſm; and, with the *Syrians*, to think that the God we ſerve is a God of the Hills, and not of the Plain. I cannot therefore but juſtly wonder at thoſe who can feel the Bowels of the Earth in Convulſions, and Nature rending in Pieces, and the God of Nature at the ſame time not rever'd by the moſt laſting Acts of Worſhip and Obedience! To ſuch I would only beg Leave to relate a Story I have met with, and ſhall leave the Application to themſelves; which may very eaſily be done; tho' originally introduc'd,

if

if I remember right, to convince them of the Folly of Atheism.

A certain Hermit, who had sequester'd himself from the Hurry and Business of the World, and lived a retired and abstemious Life, was met one Day by two Cardinals, in all the Grandeur and pompous Shew of a glittering Equipage: They accosted the poor Man after this or the like manner: 'Father, 'why should you emaciate your Body, by denying 'yourself those Refreshments that others enjoy, and 'relish so sweetly? And why should you abandon the 'Splendor of a Court, or bid adieu to the Pleasures 'that so plentifully surround us? If there should be 'neither a God, nor a Future State, to reward you 'for these Severities, how can you avoid the Im-'putation of Folly and Dotage, in thus despising 'present Satisfactions for an imaginary Nothing?' To which the honest Hermit immediately reply'd, 'But, Sirs, suppose there should be a God, and a Fu-'ture State, to punish you, will not the Imputation 'of Folly return upon your own Heads, for running 'that desperate Risque of being miserable to Eter-'nity, for staking down your Thoughts to this pre-'sent World, and valuing nothing but the empty 'and short-liv'd Pleasures that you are now glory-'ing in?' Which Answer carry'd such a plain Conviction with it, that the Cardinals turn'd from him sorrowful and dejected.

L.

A Letter from the ſame to the Pr. R. S. *containing further Particulars of the ſame* Earthquake.

Read Oct. 25. 1750. THE kind Favour of your laſt demands my Acknowledgments to be made in a better Manner than the continual Avocations in which I have been of late engaged will enable me to do; but I am perſuaded the Deficiency of my Account of the Earthquake, which was ſome time ago felt in theſe Parts, will be abundantly ſupplied by that, which my worthy Friend the Rev. Dr. *Doddridge* tells me by Letter this Morning he has tranſmitted to you by the Hands of Mr. *Baker*.

As to the Extent of this *Phænomenon*, with reſpect to the South and South-Weſt (of which alone I am at preſent capable of giving you any Information), it ſeems not to have reach'd much further than *Towceſter*: For it was not perceiv'd at *Stony-Stratford*, 8 Miles South of that Place on the *London* Road; nor at *Newport-pagnel* in *Buckinghamſhire*, ſomewhat more to the Eaſt of that Town.

I ſpent the Week before laſt at Mr. *Blencow's*, at *Marſton St. Laurence* in the South-Weſt Angle of our County; and found that it had not been perceiv'd there, nor in the other Towns on the Borders of *Oxfordſhire*.

We went from thence to Mr. *H lbeche's* of *Farnborough*, 8 Miles Weſtward of *Marſton*, on the Confines of *Warwickſhire*, where we could hear nothing

nothing of it; tho' it was felt at *Stockton* and *Leamington*, Villages lying more to the North in the ſame County, about 6 Miles from *Warwick*.

It did not reach *Warwick*, but paſs'd on to *Rugby*, and from thence enter'd *Leiceſterſhire*. I lately ſent Mr. *Ward* a Letter *, which I received from Sir *Thomas Cave*, Baronet, at *Stanford*, on the Borders of that County; whereby it appears, that the Shock and Exploſion were felt in a very ſurpriſing Manner there.

Wm. Hanbury Eſq; of *Kelmarſh*, in the Road from *Northampton* to *Market-Harborough*, told me laſt Week, that it was felt ſo violently there, that the Miniſter and the Congregation went out of the Church; the Roof of which ſeem'd to be disjointed, and ready to fall: And his Lady, who was at home, leaning forwards to read, was ſhaken out of her Chair upon the Floor. I hear that ſeveral repeated Vibrations of the Shock were perceived at *Peterborough*; the Particulars of which I expect ſoon from a Gentleman who lives in that Place.

In Anſwer to your ſecond Query, I find different Accounts given by different Perſons. Sir *Thomas Samwell*, Baronet, at *Braddon*, 3 Miles Weſt of *Towceſter*, being in his Garden with two of his Servants, heard nothing of the Exploſion. Some of my Neighbours tell me they perceived it. Mr. *Brookes*, our Clerk of the Peace, informs me, that he was walking abroad, at a conſiderable Diſtance from any Buildings, at a Place call'd *Oakly*, 3 Miles from *Kettering*, and there heard the Noiſe as of a riſing ruſtling Wind, during the Time that he walk'd 20 or 30 Yards.

The

* *See* p. 706.

The Difference of theſe Accounts may, in my Opinion, be reconcil'd, by ſuppoſing, that the Exploſion might have been heard abroad in ſuch Places where it was more violent; and not in others where it was leſs ſo.

As for any thing (I preſume you meant lambent Flame, Vapour, *&c.*) being perceiv'd on the Surface of the Ground, before or during the Earthquake, nothing of this kind has as yet been mention'd to me from any Quarter.

I find there has been a Report of a Meteor, like a Ball of Fire, appearing in the Morning before the Shock was felt; but it is, by the judicious Part of the World, rank'd among the other *Mirabilia* uſually invented upon theſe Occaſions to amuſe the Vulgar. I am, Sir,

Your moſt obedient, &c.

J. Nixon.

LI.

A Letter from the Rev. P. Doddridge *D.D. to Mr.* Henry Baker *F.R.S. containing ſome Account of the late* Earthquake *felt at* Northampton.

Northampton, October 17. 1750.

Read Oct. 25. 1750. THE Shock of an Earthquake lately felt here, which has been ſo much talked of, and in ſome public Papers magnified far beyond the Truth, happened on *Sunday* the 30th of *September*,

September, about 20 Minutes after 12 at Noon. Our *Mercury* ſtrangely fixed it at a Quarter before One; which is ſo palpable a Miſtake, and contrary to the certain Knowlege of ſo many Hundreds of People, that I could not but be ſurpriſed to ſee it.

The Effects here were by no means ſo conſiderable as were repreſented, eſpecially at *London*. I was at that time in Company with a pretty large Number of Friends, juſt returned from divine Worſhip, and hardly ſet down in the Parlour; but no one of us felt any thing of it; and if we heard any Noiſe, did not diſtinguiſh it from a Coach: But ſome Gentlemen, who were retired into their Studies up two Pair of Stairs, plainly felt it; yet they were not the twelfth Part of the Perſons then in my Houſe, who all, whether on the Ground, or firſt Floor, were quite inſenſible of it. However, it is certain that a great Number of Perſons in different Parts of the Town, perceived themſelves lifted up by it, as they were in their Houſes, tho' hardly any in the Streets took Notice of it. Thoſe that accurately obſerved it, deſcribe it as ſomething horizontal rather than perpendicular. A Lady of my Acquaintance ſtanding with her Face to the South-Weſt, plainly felt her Heels lifted up, and was thrown ſo much on her Toes, that ſhe was in Danger of falling: And it was obſerved, that ſome Caſements were moved outward, as if an Attempt had been made to force them open, and the Clattering of Saſhes was as when a ſtrong Wind blows againſt them.

In the long Street that runs from South to North, it was obſerved, that the Shock was felt more on the Eaſtern than the Weſtern Side of the Way; and I

think the whole Eaſtern Part of the Town was moſt affected. Dr. *Stonehouſe*, who lives in that Part of it, felt it with great Violence, as if a loaded Waggon had run ſtrongly againſt the gable End of his Houſe: And tho' the Walls are remarkably thick, he was greatly alarm'd with an Apprehenſion that they would have fallen.

What further confirms this Remark of the horizontal, or at leaſt oblique Direction of the Impulſe is, that a Cradle was rock'd by it. In the Houſe of Mr. *Yeoman*, where our little philoſophical Society meets, it threw down a Board from the Teſter of a Bed; yet Mr. *Yeoman* himſelf did not feel it.

There was a Report, that in *Abington-Street* ſome Chimnies were thrown down; and this brought Numbers of People from different Parts of the Town, to ſurvey the ſuppos'd Ruins; but it only ſerved to illuſtrate the Uncertainty of Rumour. However, it was true that a few Bricks were thrown down from a Chimney in *College-Lane*.

It is very certain, that all who felt the Shock heard a hollow ruſhing Noiſe; which, ſo far as I can learn, ſeemed to come in a Direction from the South-Weſt to the North-Eaſt. In Rooms where ſeveral Perſons were together, ſome were ſtrongly ſenſible of it, while others felt nothing at all: And (*cæteris paribus*) I think it was felt more ſenſibly by thoſe above than thoſe below, and by ſuch as were ſitting, ſtanding, or leaning, rather than walking.

A lumbering kind of Noiſe was heard by ſome in lower Apartments, as if ſome one over their Heads had fallen down on a ſudden, with a dead Weight;

and

and ſome thought they heard ſuch a Noiſe in the Floor beneath; ſome thought the Quivering of the Ground continued longer than others apprehended; But I have met with none who in this reſpect were ſo accurate in their Obſervations, as my ingenious Friend Mr. *Shippley*, who aſſures me that he felt four diſtinct Concuſſions (the ſecond and third of which were much more violent than the firſt and laſt) all within 3 or at moſt 4 Seconds.

As far as I can learn from the moſt diligent Inquiry I can make, the Tremulation of the Ground extended itſelf at leaſt 60 Miles in Length from South to North, and from Weſt to Eaſt about 25, or at moſt 30.

It did not affect either *Newport-pagnel*, or *Towceſter*, to the South; but was felt very near the latter, and at leaſt 6 Miles South of this Place, and all the Way between that and *Nottingham*, and a little beyond it Eaſtward; it ſcarce reached *Higham-Ferrers*, and was not felt at *Coventry*, and but very feeble within 5 or 6 Miles to the Eaſt of it: But its greateſt Violence ſeemed to have been ſpent on the Villages of *Creaton*, *Cottesbrook*, *Kilmarſh*, *Maidwell*, *Eveſton*, and ſome other ſmall Towns within 4 or 5 Miles of *Market-Harborough*, moſtly between us and that Place.

At *Creaton*, a Friend of mine was ſo moved, as he ſat at Dinner, that his Elbow ſtruck againſt the Wall, tho' he ſat at ſome Diſtance from it; the Roof of the Houſe gave a great Crack; and in a neighbouring Houſe a braſs Kettle was thrown down, as in another a Plate of Pewter was.

At *Cottesbrock*, *Kilmarſh*, and *Weſton*, the Congregations, which were not yet come out of their reſpective Churches, were all exceedingly terrified; ſome ſhrieked out; others quitted the Place; and the worthy Clergyman at *Weſton with Sutton* near *Harborough*, ſays, in a Letter publiſhed in our *Mercury*, dated the 2d inſtant, 'that, as they were ſing-'ing after Sermon (he adds, a Quarter before One) 'the whole Congregation were thrown into the 'utmoſt Conſternation, ſo that the Singers could 'hardly prevail on themſelves to finiſh the Anthem.' He adds, 'that he thought that Part of the Church 'betwixt the Chancel and the Pillar next to it, 'would have ſunk into the Earth; and that it was 'attended with a loud and dreadful Noiſe, from a 'ſort of ſubterraneous Exploſion.'

At *Maidwell*, Mr. *Scawen*, leaning upon a large Marble Chimney-Piece, was violently ſhaken; and in the neighbouring Pariſh of *Kilmarſh*, Mrs. *Hanbury*, who was then reading by her Fire-ſide, her Chair being tilted forward, was thrown down on her Hands and Knees; and the whole Pariſh at Church were ſo alarm'd, that they broke up the Aſſembly, and ran out into the Church-yard; but the Miniſter perſuaded ſome of them to return, and diſmiſſed them (as I am told) with an *extempore* Prayer proper to the Occaſion.

Some ſtrange Stories have been told of much more violent Effects produced elſewhere; particularly that a Chaſm was open'd at a Garden at *Daventry*; but I can find no real Foundation for them.

No Building, that I can learn, has any-where been thrown down; but I am very credibly informed, that

that a Beam in the new Toll-houſe near *Harborough* was ſplit by the Shock: and one tragical Effect is certain; I mean, that Mrs. *Alicock*, Wife to the chief Gentleman in *Loddington*, who had been deliver'd of her firſt Child a few Days before, and was in a very fine Way, was ſo alarmed with the Accident, that ſhe expired within a few Hours, to the great Grief of all that knew her.

I was ſurpriſed to ſee how little the Inhabitants of *Northampton* were impreſſed with this awful (tho' by no means ſupernatural) Event: The Sound of ſuch a Shock was, in a manner, grown familiar to their Ears, by what they had heard from *London*, and other Places. Many did not themſelves perceive it; others found it very gentle; and in a very few Hours it ſeem'd to have affected them no more than a Shower of Rain.

I obſerve, that moſt Accounts from the Northern Parts date the Shock later than we felt it here; but that may perhaps be accounted for by the Difference of Clocks; but where they were moſt exactly adjuſted, all agree pretty well as to the Time. I find alſo, that the Degree of the Shock was very different in nearly contiguous Places. Thus at *Eaſton-Maudit* it was hardly felt at all; but at *Caſtle-Aſhby* was very violent. It was ſenſibly perceived at Lord *Pomfret's*, and not at all at *Towceſter*, tho' within half a Mile of it; and, generally ſpeaking, the higher Places were moſt affected, tho' in ſome it was quite otherwiſe.

It had been calm cloudy Weather for ſeveral Days before; and what little Wind there was to be perceived was generally North-Weſt. The Height of the

the Barometer was as follows, on and about this remarkable Day; *viz.*

Thurſday, Sept. 27.	29—95
Friday, Sept. 28.	29— 9
Saturday, Sept. 29.	29—88
Sunday, Sept. 30.	29—79
Monday, Oct. 1.	29—68
Tueſday, Oct. 2.	29—80
Wedneſday, Oct. 3.	29—83

The Morning on which this *Phænomenon* happened was remarkably calm; but quickly after the Shock the Wind roſe, and Clouds which had covered the Heavens for ſeveral Days, were pretty much diſperſed. On *Monday*, and on *Tueſday* and *Wedneſday*, the Sun ſhone clearly all Day long. There was a Report, that, on the Morning of that *Sunday*, about 4 o' Clock, a Ball of Fire was ſeen; but I could not trace it to any Certainty. On *Monday* Night the Sky in the Eaſt was as red as Blood; and, on *Tueſday* Night, we had abſolutely the fineſt *Aurora Borealis* that I remember to have ſeen; of which I ſhall add a ſhort Account, by way of Poſtſcript, when I have added a miſcellaneous Circumſtance or two to thoſe I have mentioned concerning the Earthquake.

I am told, that, in ſome Places, two Shocks were felt, nearly at the ſame time, and within a few Seconds of each other. This is ſaid to have been the Caſe at *Noſely* in *Leiceſterſhire*, which ſtands very high; and at *Yelvertoft* in this County. But I have received the moſt certain Account of this from *Hill-Morton*. Mr. *Pool*, who keeps the Turnpike there, and

and is remarkably curious, for a Man in his Sphere of Life, informs me, that he felt himſelf moved, as he ſat in his Chair, in ſuch a manner, that he thought ſomebody had been at the Door; or (if I underſtand him right) as if ſomething had fallen againſt it: And when he came to the Door, about two or three Seconds after, he felt a Motion that he certainly knew to be an Earthquake.

I do not hear of any thing ſeen in or upon the Ground; unleſs the Caſe of a good Woman at *Welden* may be counted an Exception; who ſays, that, while ſhe was ſhaken by it, ſhe ſaw the Ground move around her.

Mr. *Scawen* is very confident, that he heard that ruſhing Noiſe (ſo generally ſpoken of by all who obſerved any thing extraordinary) not only before, but after the Shock; and that he could by both trace the Direction mentioned above.

I ſhall only add, that a very worthy Lady of this Town (Niece, as I remember, to Sir *Hans Sloane*) obſerved, that, juſt before the Shock, her Birds drooped remarkably, and hid their Heads under their Wings: A Circumſtance which is often obſerved in *Italy*, and other Places where theſe *Phænomena* are frequent.

Theſe are the moſt material Circumſtances I have yet had an Opportunity of collecting; and if any thing elſe, which ſeems at all worthy of Notice, ſhould occur, I ſhall be very ready to impart it.

P. S. The principal Circumſtances attending the *Aurora Borealis* mention'd above, were as follows:

On

On *Tueſday*, the Second of this Month, as I was walking home from a neighbouring Village, between Six and Seven in the Evening, the Sky being remarkably clear, and the Moon then ſhineing with delightful Luſtre, I happened to turn, and obſerve in the North-Eaſt a pretty large Cloud, nearly in the Form of a Globe; which ſeemed firſt of a whitiſh, then of a very luminous Appearance. It ſeem'd connected with a Cloud, which was dark, and ſomewhat bluiſh, which ſpread itſelf (almoſt like a vaſt Beam of a Building) from the North-Eaſt to the North-Weſt. At each End it was a little bent towards the Horizon; but by far the greater Part was in a horizontal Poſition, and ſeemed to occupy the Northern Part of the Heaven, from the Altitude of 10 to about 15 Degrees. The Cloud I firſt mention'd ſoon appear'd like a Globe of lucid Fire, much brighter than the Moon; and ſhot Coruſcations, ſometimes in a perpendicular Direction, but much more towards the dark horizontal Beam, if I may be allow'd ſo to deſcribe it (thro' which, by the way, I could not then diſcern any Stars). Thro' this the Light darted from North-Eaſt to North-Weſt; ſo that at length it ſeem'd all in a Blaze; and from it there ſhot up ſeveral luminous Pillars, perpendicular to the Horizon, and directed towards the Zenith. They were of very unequal Lengths, and ſome of them appear'd in a conical rather than a cylindrical Form. As thoſe to the Weſt brightened, thoſe firſt raiſed diſappeared; till at length all the horizontal Tract of Light vaniſhed, and ſome long truncated Pillars, often varying

varying their Length, remained in the Weſt; often riſing almoſt to the Zenith, but generally ſeeming to hang between 30 and 70 Degrees, ſo far as I could conjecture. When this beautiful Appearance ceaſed, the Sky appeared reddiſh in the Eaſt; what before conſtituted the lucid Globe, ſeemed reſolved into light Clouds, of various Forms; and that Part of the Horizon looked much as it does in a Summer's Morning, when the Sun is within a few Minutes of its riſing, and tinges the Clouds of a light Red. But all this ſeemed to diſperſe in a few Minutes, about Seven; and I neither ſaw nor heard of any thing remarkable.

LII.

An Account of the Earthquake *which happen'd about a Quarter before One o'Clock, on* Sunday, September 30. 1750. *by Mr.* ——— *Steward to the Earl of* Cardigan.

Deene, Oct. 2. 1750.

Read Oct. 25. 1750. IN the Morning there was a gentle weſterly Wind, ſomething cool; but for ſome time before the Earthquake happen'd, it was quite calm and cloſe, and much warmer. The Air was very dry, and filled with Clouds that had no Motion, but prevented the Sun's appearing (I think) all Day. The Noiſe that preceded the Earthquake was, for a few Seconds, like the rumbling

of a Coach upon a Bridge, or Thunder at a Diſtance, when there were two conſiderable Exploſions very near one another, which gave the great Shock; and after that the Noiſe continued as before for about half a Minute, the Earth trembling all the while; but I don't find any body perceived any ſulphureous Smell.

The Direction of the Earthquake was from Weſt to Eaſt; as was very eaſily diſcerned by every body that was out of Door, as I was, and took notice of the Noiſe.

It is probable it began in *Derbyſhire*, or ſome of the Counties to the Weſt of that (for I am informed it was felt as much at *Derby* as here, and at all Places between); and paſſed off the Iſland thro' *Lincolnſhire*, and Part of *Cambridgeſhire*.

The Breadth from North to South I imagine to be 40 or 50 Miles; of which much the greateſt Part lay North of this Place.

The Force of the Shock was chiefly, if not intirely, lateral; and ſo conſiderable, as that ſeveral People, who were ſitting in Chairs, catched at the Walls, Tables, and ſuch things as ſtood next them, expecting they ſhould be thrown down: Buildings of all Kinds were ſhaken greatly; and the Beds, Chairs, and ſuch things as ſtood above-ſtairs were diſplaced, and rocked about very much: Windows were ſhaken as if they would have been broken; and in ſeveral Places Pewter upon Shelves in Kitchens thrown upon the Floor.

At ſeveral Churches, where divine Service was not finiſhed, both in this County, *Rutland*, and *Leiceſterſhire*, the People were ſo alarmed, that they

they ran out, fearing the Churches would fall on their Heads; and ſome were ſo terrified, they ſwooned away.

At *Stonton*, ſome of the Plaiſtering of the Church was ſhaken down; which moſt terribly frightened the People that were in it, and obliged them to run out. ——— I have not heard of any Damage being done by it more than ſome Chimnies thrown down, but nobody hurt by them.

P. S. Deene ſtands cloſe to the Road which leads from *Northampton* to *Stamford*; it is about 25 Miles from the former, and 10 from the latter.

LIII.

Extract of a Letter from Mr. Henry Green *to Mr.* James Ayſchough, *Optician, in* Ludgate-Street, *relating to the* Earthquake *felt* Sept. 30. 1750.

Rolleſton in *Leiceſterſhire, Oct.* 22. 1750.

Read Oct. 25. 1750.

AS I have Room enough, I may as well give you ſome little Account of the Earthquake which happen'd in this and the neighbouring Counties, on *Sunday* the 30th of laſt Month, about half an Hour paſt 12 at Noon.

The firſt Shock appear'd to us, at our Houſe, as if a large Stack of Chimnies had fallen through the Roof upon the Chamber-floor over our Heads (which at firſt we took to be the Caſe, but in a

very few Seconds recollected what it was). This was ſucceeded by a prodigious rolling Noiſe, as if the whole Houſe was falling upon us, which we expected it would do, before we could get out of it. When we were out, we could not help looking behind us, to ſee if any thing was fallen; but found all ſafe. We could perceive the Floor, *&c.* to ſhake very ſenſibly; and a Walking-ſtick, that ſtood in one Corner of the Parlour, was thrown down: It alſo ſhook down ſeveral large Stones from off an Heap that lay in the Yard.

A Gentleman, who was walking from his own Houſe to dine with us, happened to lay his Hand upon a Gate, to open it, juſt after the firſt Noiſe, and found the Gate-Poſts, *&c.* to ſhake and totter about as if they were falling. In a great many Places Service was not ended at Church; and in ſome the whole Congregation ran out, and happy they that could get out firſt. A Gentleman of Fortune near *Leiceſter*, narrowly eſcaped being killed by one of his own Chimnies; which fell ſo near him, that ſome of the Bricks grazed upon his Shoulder.

By what I can hear, it reached 30 or 40 Miles from us each Way; and I fanſy we were not far from the Center of it.

As near as I can judge, it laſted about 20 Seconds at leaſt; but its Duration and Appearance was different to People in different Places.

LIV.

LIV.

Extracts of Letters from Maurice Johnſon, *Eſq*; *Preſident of the Gentlemens Society at* Spalding, *and from* John Green *Eſq*; *Secretary of the ſame, to* Emanuel Mendez da Coſta, *Eſq*; *F. R. S. concerning an* Earthquake *felt on* Aug. 23. 1750.

Extract of a Letter from Maurice Johnſon, *Eſq*; *to* Emanuel Mendez da Coſta, *F. R. S. dated at* Spalding *in* Lincolnſhire, *25th* Auguſt 1750.

Read Nov. 1. 1750.

ON *Thurſday* the 23d Inſtant, the Air mild and calm, no Wind ſtirring, the Sun ſhining bright, at about 45 Minutes paſt 6 o' Clock in the Morning, a Shock of an Earthquake was ſenſibly felt here, and hereabout, attended with a loud Noiſe, and Crack (as ſome call it): This was perceived both Southward, and Northwardly, for ſome Seconds. A Gentleman from *Newark* in *Nottinghamſhire*, N. E. of us about 30 Miles, ſays it was alſo felt there.

Extract, concerning the ſame Earthquake, from a Letter of Dr. John Green, *of the ſaid Place.*

THE Earthquake was ſenſibly felt through the whole County of *Lincolnſhire*, which is above 70 Miles; but moſt ſtrongly on the Coaſt. The Weather had been for ſome Days before mild and calm: An

Aurora

Aurora Borealis appeared vertically, ſhooting Rays of all Colours around, which turned to a very deep red Colour.

LV.

Part of a Letter from the Rev. Henry Miles, *D. D. F. R. S. to Mr.* H. Baker, *F. R. S. concerning the* Earthquake *felt on* Sept. 30. 1750.

Tooting, October 30. 1750.

Read Nov. 1. 1750.

A Worthy Friend, the Rev. Mr. *Daniel Goodrich*, who liveth at *Oundle* in *Northamptonſhire*, has ſent me an Account of the Earthquake felt in that and the neighbouring Counties, on *Sept.* 30th, at 12 ½ at Noon.

He informs me, that he was then at *Uppingham* in *Rutlandſhire*, ſitting in a Room intent on writing and thinking, when he was ſurpriſed with a Sound very ſtrong and awful; which, at the firſt Moment, made him think of the rattling of a Coach upon the Pavement: But this Apprehenſion was immediately corrected by ſomewhat very different in the Sound, and raiſed in him an Idea of the craſhing of a falling Houſe. He felt himſelf in a very ſhaking way: The Table at which he ſat ſhivered, and the Windows of the Room jarred: But he did not think of an Earthquake, till the People of the Houſe came into the Room, and told him what had happened. Some Slates were ſhaken off the Houſes, and in one Houſe the Hammer of a Clock ſtruck the Bell: Some Chimnies were thrown down; many talked of a ſenſible

ſenſible Heaving of the Ground: But, he ſays, he is credibly informed, that, in one Houſe in that County, the Mud Floor was cracked not a little in three or Four Places. In one Houſe, in the Town of *Uppingham*, where two Men and a Woman were ſitting, upon the Approach of the Sound (tho' they had no Thought of an Earthquake), the Men could hardly draw their Breath in the Houſe; but were immediately obliged to go out for freſh Air; but the Woman felt no Diſorder. My Friend adds, that attentive Obſervers apprehended the Sound to have moved from the N. to the S. or from N.W. to S.E. and that himſelf had the ſame Apprehenſion; and that, according to his preſent Intelligence, the whole Shock was felt in the Counties of *Northampton*, *Leiceſter*, *Nottingham*, *Rutland*, and *Lincoln*, affecting a Tract of the County of about 60 Miles in Length, and as much in Breadth. I have given you the Account in his own Words, with very ſmall Variation.

LVI.

A Letter from the Rev. Mr. John Nixon, *F. R. S. to the* Preſident, *ſerving to accompany a Letter from Mr.* William Smith *to Mr.* Nixon, *giving a very particular Account of the* Earthquake *felt on* Sept. 30. 1750.

SIR, *Higham, November* 8.

Read Nov. 15. 1750. THIS waits upon you with a Letter I have juſt received from *Peterborough*. I hope the Veracity of my Correſpondent, who

who is Regiſter of the Place above-mentioned, and a Gentleman of good Credit, will atone for ſome Defects in the Form of his Account.

Since I had the Honour to write to you laſt, I have met with two Gentlemen in my Neighbourhood, one of them a Clergyman, who aſſured me, that, about 6 or 7 o' Clock on the Morning before the late Earthquake, they both ſaw a Ball of Fire in the Air, reſembling the Meteor commonly called a falling Star; only with this Difference, that this Phænomenon, after running ſome Space, burſt into ſeveral ſtreaming Rays, conſiſting of Sparks of Fire, in the manner of a Sky-rocket. I am,

SIR,

Your moſt obedient humble Servant,

J. Nixon.

Reverend Sir.

I Received your Favour of the 16th current; and the following Account of the late Earthquake, as it was variouſly felt here, is an Anſwer thereto; which (as I could gather it from others, and collect of myſelf) pleaſe to take as follows:

Some little time after Morning Service at the Cathedral Church was over, as near as I can gueſs about 25 or 30 Minutes paſt Noon, as I was in my Garden with two Friends, it being exceedingly calm, the Sky ſomewhat covered with light mottled Clouds, I took Notice of a hollow odd Noiſe, and at firſt judged it to be a Coach under the Monaſtery Walls;

Walls; but ſoon found it was otherwiſe; and all of us then judg'd it to be Thunder at a Diſtance, but pretty loud, and of a hollow Report. I was then 40 Yards at leaſt from my own Houſe, and about half that Diſtance from Mr. Archdeacon *Browne's*, and not any Buildings to the South of us. I heard the Noiſe of the Exploſion at leaſt two Minutes after I took Notice of it. Its Courſe, as I could plainly diſtinguiſh, was from N. E. to S. W. or thereabouts. We felt no ſort of Shake, nor did my Wife or Family in the Houſe. My next Neighbour to the South of me, and his Family, being at Dinner, felt the Shock after the Noiſe had partly paſſed, and were ſenſible what it was; but not very much, and but for a ſhort Space of Time.

A Perſon of very good Reputation, who lives in the *Minſter-Cloſe*, was then in a Chamber, heard the Noiſe, ſuſpected the Cauſe (it being *Sunday*, and no Carr about), immediately threw up the Saſh, and obſerved, as the Noiſe of the Exploſion decreaſed, the Shock came on: The Tables, Chairs, *&c.* in the Chamber ſhook; the Windows clattered: He very ſenſibly felt the Shock, which he affirms laſted a Minute at leaſt; only, when it firſt ſhook, it was with the greater Violence, and dwindled away by little and little, till 'twas gone, in the ſame manner as went the Noiſe. The People below were all affected by it; but not ſo much, or ſo long.——One other Perſon in a narrow Street in the Town, ſitting in a low Room, with a Brick Floor, heard the Noiſe, but judged it to be an odd Lumber above Stairs, or ſome Carriages coming on (as moſt People firſt thought who were within Doors); and preſently the Floor

under his Chair heaved, and continued in a ſurpriſing Agitation for one Minute. He was very much alarmed, and ran into the Street, where a great Number of People inſtantly appeared; ſome to ſee if any Coaches or Carriages were coming, others to get away, expecting their Houſes were tumbling; and others finding ſomewhat extraordinary had happened, but at that Inſtant did not know what, and came to ſee, *&c.* The Perſon who felt the Ground heave was ſo frighted, that he became ſick thereupon. At *Longthorpe*, a Mile Weſt of us, the Clergyman who did Duty there was juſt then ſat down to Dinner with Sir *Francis St. John*, Bart. and his Daughter, when a rumbling Noiſe was heard, particularly in the Chimney. Sir *Francis* expected the ſame was on Fire, got up to ſee; which ſuddenly ceaſed, and immediately was ſucceeded by a Concuſſion of the Ground. I had this from the Clergyman, who tells me further, that he felt it ſo ſenſibly, that he was obliged to relinquiſh his Chair, and, when upon his Legs, to lay his Hands on the Table to ſupport himſelf. Miſs *St. John* was in like manner affected. Sir *Francis* only heard the Noiſe, which he compared (and, for what I know, very properly) to the Exploſion of a Cannon at a Diſtance, not being in the leaſt ſenſible of any Motion under Foot, altho' the Diſtance between the Parties was very inconſiderable. The Sideboard, with the clattering of Glaſſes, *&c.* they thought was tumbling: They were ſo ſurpriſed, that he doth not remember how long the trembling continued. A Perſon in the ſame Village affirms, that, being ſitting, he was ſuddenly lifted twice or thrice on the Ground,

as

as with a Spring, and drop'd again. Many People felt it there in various Shapes. —— At *Caſtor*, a Mile and Half ſtill farther Weſt, one Mr. *Serjeant* ſays, that, looking out of a Window a conſiderable Height, he found the Houſe reel more than once, and then come into its Place again with a Jolt.——Many very odd Inſtances we have of it. Some heard the Noiſe, and felt not the Shock; others felt it, and did not hear the Noiſe. I am informed it was felt at *Boſton*, which lies about 30 Miles near North of us; and it was felt a few Miles to the South: So that its Extent here, from NW. to SE. or thereabouts, ſeems to be about 40 Miles.—— Upon the Whole, I find, the higher one was, as farther from the Centre, the more the Shock was felt; that it was local; the Sound of the Exploſion was heard as well abroad as in the Houſes, tho' People differently ſituated judged differently what the Sound was; that not any Smoke, Vapour, or Flame, appeared on the Surface, as I have heard. —— I am

Your moſt obedient Servant,

W^m. Smith.

LVII.

The Philoſophy *of* Earthquakes; *by the Rev.* William Stukeley, *M. D. F. R. S.* &c. *in a Letter to* Martin Folkes, *Eſq*; *LL. D. and* Preſident *of the* Royal Society, *&c.*

Read Dec. 6. 1750. SINCE I had the Honour to lay before the Society, in the Spring, my Thoughts upon Earthquakes, we have had many

Opportunities of reflecting on that moſt awful, and hitherto unuſual, Appearance. The Year 1750. may rather be called the Year of Earthquakes, than of *Jubilee*. For, ſince they began with us at *London*, as far as I can learn, they have appeared in many Parts of *Europe*, *Aſia*, *Africa*, and *America*, and have likewiſe reviſited many Counties in our Iſland: At length, on 30th of laſt *September*, taken their Leave (as we hope) with much the moſt extenſive Shock we have ſeen in our Days.

It may well be expected, that theſe frequent Viſits, in themſelves ſo very extraordinary, to us ſo rare, and that in one Year, ſhould keep up our Attention; and, as to my own Part, induce one to reflect on what I before offered concerning them, and be a ſufficient Apology for the preſent Paper.

We have been acquainted, by thoſe that remember it, that in the Earthquake of *November* 1703. which happen'd in *Lincolnſhire*, the Weather was calm, cloſe, gloomy, warm, and dry, in a Degree highly unuſual at that Seaſon: And thus it has been with us all the Year: And from the numerous Accounts we have received at the *Royal Society*, in the Beginning and End of the Year, where any Mention is made of the Weather, they agree in the like Particular: Which is conſentaneous to what I remarked as the conſtant Forerunner of Earthquakes, and what prepares the Earth's Surface to receive the electrical Stroke.

In my laſt we had a Paper read at the *Royal Society*, concerning the firſt Earthquake felt by us at *London* on 8th *February*. A Shepherd belonging to Mr. Secretary *Fox* at *Kenſington*, the Sky being perfectly

fectly ſerene and clear, was much ſurpriſed with a very extraordinary Noiſe in the Air, rolling over his Head, as of Cannon cloſe by: He likewiſe thought that it came from the North-weſt, and went to the South-eaſt; a Motion quite contrary to what muſt have been the Caſe, if it were really of Cannon. This Noiſe paſs'd ruſhing by him; and inſtantly he ſaw the Ground, a dry and ſolid Spot, wave under him, like the Face of the River. The tall Trees of the Avenue, where he was, nodded their Tops very ſenſibly, and quaver'd. The Flock of Sheep immediately took Fright, and ran away all together, as if the Dogs had purſued them. A great Rookery in the Place were equally alarmed; and, after an univerſal Clangor, flew away, as if chaſed by Hawks.

I was likewiſe informed, that, in the ſame Earthquake, a great Parcel of Hens and Chickens, kept at that time in *Gray's-Inn Lane*, upon the Shock, ran to the Rooſt affrighted: And the like was obſerved of Pigeons. And in our Account of the laſt Earthquake from *Northampton*, it is remarked, that the Birds in Cages put their Heads under their Wings, as to hide themſelves.

June 21. at the *Royal Society*, Mr. *Jackſon*, Potter at *Lambeth*, gave an Account of ſome Boats and Loiters, in the River at that time; the People in them ſeemed to feel as if a Porpoiſe, or ſome great Fiſh, had heav'd and thump'd at the Bottom of the Loiters. This is ſometimes the Caſe of Ships at Sea; which ſeems evidently owing to an electrical Impreſſion on the Water.

In

In the *Evening Poſt*, *June* 23: we had a Paragraph from *Venice*, that a terrible Earthquake had lately been felt in the Iſle of *Cerigo*; a little rocky Iſle. It threw down a great Number of Houſes, and above 2000 Inhabitants were buried in the Ruins.

Another Earthquake about that time happen'd in *Switzerland*, which ſplit a vaſt rocky Mountain, and an old Caſtle-Wall, of an immenſe Thickneſs.

But, ſince then, theſe wonderful Movements have ſtalked round the Globe; and again been lately felt in our own Iſland, to the Terror only of many thouſand People; beſides thoſe that appear'd in the Weſtern Parts, in the more early Time of the Year.

I received a Letter from my Friend *Maurice Johnſon* Eſq; the Founder and Secretary of the *Literary Society* of *Spalding*, which has now ſubſiſted theſe 40 Years. He acquaints me, that, on *Thurſday* the 23d of *Auguſt* laſt, an Earthquake was very ſenſibly felt there, about 7 o' Clock in the Morning, throughout the whole Town and Neighbourhood, and many Miles round; but chiefly ſpread Northward and Southward. He ſays, that, for a Fortnight before, the Weather had been ſerene, mild, and calm; and one Evening there was a deep-red *Aurora auſtralis*, covering the Cope of Heaven, very terrible to behold. This ſame Shock was felt at *Grantham*, *Stamford*, and *Milton* by *Peterborough*; and generally at all the intermediate Places.

Since then, I had a Letter from Mr. Alderman *Taylor*, of *Stamford*, giving an Account of another Earthquake, that happen'd there on *Sunday*, *Sept.* 30 at 36 Minutes after 12 o' Clock at Noon. He deſcribes

deſcribes it thus: 'They were ſuddenly ſurpriſed 'with an uncommon Noiſe in the Air, like the 'rolling of large Carriages in the Street, for about '20 Seconds. At the ſame Inſtant they felt a 'great Shake, or Snap (as he calls it); inſomuch 'that it ſenſibly ſhook a Punch-bowl, which was 'in his Parlour, and made it ring. He ſays, it was 'perceived of moſt of the People of *Stamford*, 'who generally ran out of their Houſes. At *Oke-*'*ham*, the chief Town in *Rutland*, the Congrega-'tion ran out of the Church. All the Towns 'round *Stamford* were ſenſible of it, and at *Pe-*'*terborough*, down to *Wisbich*.'

Thus far the Alderman. But we have had many Advices from all Hands, at the firſt and ſecond Meetings of the *Royal Society*, for the Winter-Seaſon; with further Particulars relating to this great Conſuſion: That it was felt at the ſame time at *Rugby* in *Warwickſhire*, and reach'd to *Warwick*; at *Lutterworth* in *Leiceſterſhire*; at *Leiceſter*, and round about. They deſcribe it, that the Houſes totter'd, and ſeem'd to heave up and down, tho' it laſted but a few Seconds. It was attended with a ruſhing Noiſe, as if the Houſes were falling; and People were univerſally ſo affrighted as to run out; imagining that their own, or Neighbours Houſes, were tumbling on their Heads. In the Villages around, the People, being at divine Service, were much alarm'd, both with the Noiſe, which exceeded all the Thunder they had ever heard, beyond Compare; and with the great Shock accompanying, which was like ſomewhat that ruſh'd againſt the Church-Walls and Roof; ſome thinking the

Pillars

Pillars crack'd; many, that the Beams of the Roof were disjointed; and all, that the Whole was falling; and happy were they that could get out firſt. A few Slates, Tiles, and Parts of Chimnies, fell from ſome Houſes; Pewter, Glaſſes, and Braſs, fell from Shelves; a Clock-Bell ſometimes ſtruck; Windows univerſally rattled; and the like Circumſtances of Tremor.

The ſame extended itſelf to *Coventry*, *Darby*, *Nottingham*, *Newark*; then came Eaſtward to *Harborough*, *Towceſter*, *Northampton*, *Rowell*, *Kettering*, *Wellingborough*, *Oundle* in *Northamptonſhire*, *Uppingham*, *Okeham* in *Rutland*, *Stamford*, *Bourn*, *Grantham*, *Spalding*, *Boſton*, and to *Lincoln*, in *Lincolnſhire*; *Holbech*, and all *Holland*, in that County; *Peterborough*, *Wisbech* in the Iſle of *Ely*, together with all the intermediate and adjacent Places. Then it paſſed over the whole Breadth of *Ely-Fen*, and reached to *Bury* in *Suffolk*, and the Country thereabouts; of which we had Notice from Lady *Cornwallis*: An Extent from *Warwick* to *Bury* of about 100 Miles in Length; and, generally ſpeaking, 40 Miles in Breadth. And this vaſt Space was pervaded by this amazing Motion, as far as we can get any Satisfaction, in the ſame Inſtant of Time.

In regard to Circumſtances, they were pretty ſimilar throughout. At *Northampton*, a Gentlewoman, ſitting in her Chair, relates, that ſhe and her Chair were twice ſenſibly lifted up, and ſet down again. A Stack of Chimnies were thrown down in *College-lane*; a Place retaining the Memory of a ſort of Univerſity once beginning at *Northampton*. The Windows of Houſes rattled throughout the whole Town; but

but no Miſchief done: In general, frightful, and innocuous.

They fanſied there the Motion of it, as they expreſs it, to be Eaſtward. In Streets that run North and South, the Houſes on the Eaſt Side of the Way were moſt affected: And Dr. *Stonehouſe*'s Dwelling, the ſtrongeſt in the Town, was moſt ſenſibly ſhaken. So it was likewiſe obſerved, that Churches were moſt ſubject to its Violence. They thought too that the Motion ſeem'd rather horizontal, or lateral, than upward. Some counted the Pulſes diſtinctly, to the Number of four: That the ſecond and third Pulſe were ſtronger than the firſt and fourth.

From all theſe various Accounts, there was no ſulphureous Smell, or Eruption; no Fiſſures in the Ground perceiv'd: Yet ſeveral People were ſick upon it; infinite Numbers terribly affrighted; and as ſoon forgot the Impreſſion of it, or talk'd of it in a merry Strain, as commonly with us at *London*. So little are the Vulgar affected, without ſomething very ſenſible, and ſo ſoon is the Senſe of it worn out!

It was more evidently perceiv'd by People ſtanding; moſt, by thoſe that were ſitting; leaſt, by ſuch as were walking; and in upper Stories of Houſes more than in lower, or in Cellars. Some, coming down ſtairs, were in Danger of being thrown forwards: Several ſitting in Chairs, and hearing the hollow thundering Noiſe, and thinking it was a Coach paſſing by, when they attempted to get up, to ſee what it was, they were thrown back again into their Chair. Some heard the Wainſcot crackle. A Lady, ſitting by the Fire, with her Chair leaning

forwards, was thrown down on her Hands and Knees.

It was particularly remarked (as before obſerved), that Birds in Cages were ſenſibly affrighted, thruſting their Heads under their Wings. Mrs. *Allicock*, of *Loddington*, a Lady in Childbed, was ſo affected, that it cauſed her Death. Some People felt ſuch a ſudden Shortneſs of Breath, that they were forced to go out into the open Air, it ſo affected the pulmonary Nerves. Many were taken with Head-achs.

Theſe are, in general, the Obſervations made at the time of theſe Earthquakes; when we recollected ourſelves, after the Suddenneſs and Affright. Give me Leave to make the following Remarks.

1. As far as we can poſſibly learn, where no one can be prepar'd at different Places, by Time-keepers, this mighty Concuſſion was felt preciſely at the ſame Inſtant of Time, being about half an Hour after 11 at Noon. This, I preſume, cannot be accounted for by any natural Power, but that of an electrical Vibration; which, we know, acts inſtantaneouſly.

2. Let us reflect on the vaſt Extent of this Trembling, 100 Miles in Length, 40 in Breadth, which amounts to 4000 ſquare Miles in Surface. That this ſhould be put into ſuch an Agitation in one Moment, is ſuch a Prodigy, as we ſhould never believe, or conceive, did we not know it to be Fact, from our own Senſes. But, if we ſeek for a Solution of it, we cannot think any natural Power is equal to it, but that of Electricity; which acknowleges no ſenſible Tranſition of Time, no Bounds.

3. We

3. We obſerve, the vulgar Solution of ſubterraneous Eruptions receives no Countenance from all that was ſeen or felt during theſe Earthquakes: It would be very hard to imagine how any ſuch thing could ſo ſuddenly and inſtantaneouſly operate thro' this vaſt Space, and that in ſo ſimilar and tender a manner, over the Whole, thro' ſo great a Variety as well as Extent of Country, as to do no Miſchief.

A philoſophical Inquirer in *Northamptonſhire*, who had his Eye particularly on this Point, takes notice there were not any Fiſſures in the Ground, any ſulphureous Smells, or Eruptions, any where perceiv'd, ſo as to favour internal Convulſions of the Earth; yet we learn, from a Letter, at *Uppingham* in *Rutland*, that a Plaiſter Floor became crack'd thereby. Theſe kind of Floors are frequent in this Country; what we call *Stucco* in *London*; and it gives us a good Notion of the undulatory Vibration produc'd by an Earthquake; which ſome have compared to that of a muſical String; others, to that of a Dog, or a Horſe, ſhaking themſelves when they come out of the Water.

4. The former Earthquake, that happened at *Grantham*, *Spalding*, *Stamford* (which Towns lie in a Triangle) took up a Space which may in groſs be accounted a Circle of 20 Miles in Diameter; the Centre of which is that great Moraſs called *Deeping-Fen*. This comprehends 14 Miles of that 20 in Diameter; and where, probably, the electrical Impreſſion was firſt made. Much the major Part of *Deeping-Fen* is under Water in the Winter; underneath is a perfect Bog: Now it is very obvious how little favourable ſuch Ground is for ſubterraneous Fires.

In the ſecond Earthquake, not only this Coun-

try was affected again, but likewiſe a much larger Space of the ſame ſort of fenny Ground, rather worſe than the former: All *Donington-Fen*, *Deeping-Fen*, *Croyland Fen*, *Thorney-Fen*, *Whitleſea-Fen*, *Bedford-Level*, and the whole Extent of *Ely-Fen*, under various Denominations. This Country, under the Turf, abounds with ſubterraneous Timber of all kinds; Fir, Oak, and Bruſh-wood; Stags Horns: Now-and-then they find a Quantity of Hazel-nuts, crouded together on a Heap: I have ſome of them. This is a Matter common to all boggy Ground over the whole Globe. They are the Ruins of the antediluvian World, waſh'd down from the high Country, where they grew, here lodg'd, and by time overgrown with the preſent Turf. They that ſeek for any other Solution of this Affair, than the univerſal *Noachian* Deluge, want to account for a general Effect by a partial Cauſe; and ſhut their Eyes, both to the plain Hiſtory of this Matter, and to the infinite notorious Demonſtrations of it from foſſil Appearances.

5. All this Country, tho' underneath it is a watry Bog, yet, through this whole Summer, and autumnal Seaſon (as they can have no natural Springs in ſuch a Level) the Drought has been ſo great on the Superficies, that the Inhabitants were obliged every Day to drive their Cattle ſeveral Miles, for watering. This ſhews how fit the dry Surface was for an electrical Vibration; and we learn from hence this important Particular, that it reaches but very little below the Earth's Surface.

Mr. *Johnſon*, in another Letter which he wrote to me concerning the ſecond Earthquake, obſerved at *Spalding*, ſays, upon this Occaſion, he was obliged to

to ſcour his Canal, and deepen it; that they came to a white Quickſand, which afforded to all the Neighbourhood excellent Water in Plenty.

In the gravelly Soil of *London*, and where the two Shocks were felt by us, in the Beginning of the Year, we know there is not an Houſe in the whole Extent of this vaſt City, and all around it, but a Spring of Water is ready, upon digging a Well: Whence we have much Reaſon to believe, that the internal Parts of the Earth are like a Sponge ſoak'd in Water; ſo that the only dry Part of it is the Superficies; which is the Object, and the Subject, of that electric Vibration, wherein (according to my Sentiments) an Earthquake conſiſts.

This ſhews the Miſtake of the Antients; who, fancying that Earthquakes proceeded from ſubterraneous Eruptions, built their prodigious Temple of *Diana* of *Epheſus* upon a boggy Ground, to prevent ſuch a Diſaſter.

6. Earthquakes are truly moſt violent in a rocky Country; becauſe the Shock is proportionate to the Solidity of the Matter electrify'd: So that Rocks, old Caſtle-Walls, and ſtrong Buildings, are moſt obnoxious to the Concuſſion. The Iſle of *Cerigo* was more liable, and more rudely handled by the late Earthquake; both becauſe it was an Iſle, and becauſe it was rocky. So we muſt ſay of the late Earthquake in *Switzerland*, that ſplit the Mountain and the old Caſtle-Wall. Whence Mr. *Johnſon*, in his ſecond Letter, ſays, it crack'd a very ſtrong brick Houſe in *Gosberton* by *Spalding*. Dr. *Doddridge* obſerves, from *Northampton*, that Dr. *Stonehouſe*'s Dwelling, being a very ſtrong one,

was

was moſt ſenſibly ſhaken. And, throughout the whole Extent of this great Earthquake, we find both the Noiſe, the Shock, and the Terror, was greateſt at the Churches, whoſe Walls and Bulk made more Reſiſtance than Houſes: And, generally ſpeaking, the Churches throughout this whole Extent have very fair and large Towers, and very many remarkable Spires of good Stone.

This ſame Vibration, impreſs'd on the Water, meeting with the Solid of the Bottom of Ships and Loiters, gives that Thump felt thereon. Yet, of the Millions of ordinary Houſes, over which it paſſed, not one fell: A Conſideration which ſufficiently points out to us what ſort of a Motion this was not; what ſort of a Motion it was; and whence deriv'd: Not a Convulſion of the Bowels of the Earth, but an uniform Vibration of its Surface, aptly thought like that of a muſical String; or what we put a Drinking-glaſs into, by rubbing one's Finger over the Edge; which yet, brought to a certain Pitch, breaks the Glaſs; undoubtedly an electric Repulſion of Parts.

7. We find, from all Accounts antient and modern, that the Weather preceding theſe Shocks was mild, warm, dry, ſerene, clear, froſty: What notoriouſly favours all our electrical Experiments. We very well know, that, generally, all laſt Winter, Spring, Summer, and Autumn, have been remarkably of this kind of Weather; more ſo than has been obſerved in our Memory; and have had all thoſe Requiſites, Appearances, and Preparations, that notoriouſly cauſe Electricity, that promote it, or that are the Effects of it.

8. We

8. We find the blood-red *auſtralis Aurora* preceding at *Spalding*, as with us at *London*. This Year has been more remarkable than any for Fire-balls, Thunder, Lightning, and Corruſcations, almoſt throughout all *England*. Fire-balls more than one were ſeen in *Rutland* and *Lincolnſhire*, and particularly obſerved. All theſe kinds of Meteors are rightly judged to proceed from a State of Electricity in the Earth and Atmoſphere.

9. Mr. *Johnſon*, in both his Letters to me on the firſt and ſecond Earthquakes at *Spalding*, remarks particularly of their Effects being moſtly ſpread to the North and South, and eſpecially felt on the Sea-coaſt. We may obſerve that ſuch is the Direction of *Spalding* River, which both conducts and ſtrengthens the electric Vibration; conveying it along the Sea-ſhore, thence up *Boſton* Chanel, and ſo up *Boſton* River to *Lincoln*; as we diſcern, by caſting our Eye upon a Map.

We obſerve further, that the main of this ſecond Earthquake diſplay'd its Effects along and between the two Rivers *Welland* and *Avon*; and that from their very Origins down to their Fall into the Sea. It likewiſe reached the River *Witham*, which directed the electric Stream that Way too to *Lincoln*: For which Reaſon, as there meeting the ſame coming from *Boſton*, the Shock was moſt ſenſibly felt. It reached likewiſe to the *Trent* at *Nottingham*, which convey'd it to *Newark*.

The firſt electrical Stroke ſeems to have been made on the high Ground above *Daventry* in *Northamptonſhire*, where the *Roman* Camps are, made by *P. Oſtorius* the Proprætor. From thence it deſcended

ſcended chiefly Eaſtward, and along the River *Welland*, from *Harborough* to *Stamford*, *Spalding*, and the Sea; and along the River *Avon*, or *Nen*, to *Northampton Peterborough*, and *Wisbech* to the Sea. It ſpread itſelf all over the vaſt Level of the Iſle of *Ely*, further'd by very many Canals and Rivers, natural and artificial, made for Drainage. It was ſtill conducted Eaſtward, up *Mildenhall* River in *Suffolk*, to *Bury*, and the Parts adjacent. All this Affair, duly conſider'd, is a Confirmation of the Doctrine I advanced on this Subject.

10. I apprehend it was not the Noiſe in the Air, as of many Cannon let off at once, preceding the Earthquake, that ſo much affrighted People, or affected the Sheep, the Rookery at *Kenſington*, the Hen and Chickens in *Gray's-Inn-Lane*, and the Pigeons: It could not be barely the ſuperficial Movement of the Earth that diſturbed them all at once: I judge it to be the Effect of Electricity, ſomewhat like what cauſes Sea-Sickneſs; ſuch a ſort of Motion as we are not accuſtomed to. So the Earthquake affects all thoſe of weak Nerves, or that have nervous Complaints, obnoxious to Hyſterics, Colics, rheumatic Pains in their Joints. Several Women were ſeiz'd with violent Head-achs, before both the Shocks we felt in *London*. It was this that affected the People with a Shortneſs of Breath. This made the Dog run whining about the Room, ſeeking to get out: This made the Fiſhes leap up in the Pond at *Southwark*; like as the Experiment of electrifying the Fiſhes; it makes them ſick: And this cauſes the Birds in Cages to hide their Heads under their Wings, becauſe they cannot fly away: Which is

is commonly obſerved of them in *Italy*, and Countries where Earthquakes are more frequent.

11. I obſerve, the Shepherd of *Kenſington* thought the Motion of the Earthquake, and the Sound, were from North-weſt to South-eaſt. On the contrary, Mr. *Byfield*, the Scarlet-dyer in *Southwark*, thought the Noiſe came from the River below-bridge, and went toward *Weſtminſter*; where it rattled ſo, that he did not doubt but that the Abbey-Church was beaten down.

Dr. *Parſons* took Pains to find out the Way of the Motion of the Earthquake, from the different Poſition of the Beds; but, from the contradictory Anſwers given, he could obtain no Satisfaction, as to that Point. All this, and what was obſerv'd from *Northampton*, of the Motion being thought by ſome to be upward and downward, by others, rather horizontal or lateral, the counting the Pulſes, and the like, only points out to us the prodigious Celerity, and the vibratory Species of the Motion of an Earthquake; but far, very far, is this from being owing to the tumultuous Ebullition, the irregular Hurry of ſubterraneous Exploſions.

12. How the Atmoſphere and Earth are put into that electric and vibratory State, which prepares them to give or receive the Snap, and the Shock, which we call an Earthquake, what it is that immediately produces it, we cannot ſay; any more than we can define what is the Cauſe of Magnetiſm, or of Gravitation, or how muſcular Motion is perform'd, or a thouſand other Secrets in Nature.

We ſeem to know, that the AUTHOR of NATURE has diſſeminated ethereal Fire thro' all Matter; by

which theſe great Operations are brought about. This is the ſubtil Fluid of Sir *Iſaac Newton*, pervading all things; the occult Fire diffuſed thro' the Univerſe, according to *Marſilius Ficinus*, the *Platonic* Philoſopher, in the *Timæus* of his Maſter. And the *Platoniſts* inſiſt on an occult Fire paſſing thro' and agitating all Subſtance by its vigorous and expanſive Motion.

Before them, *Hippocrates* writes in the ſame Senſe, I. *de victus ratione*, that this Fire moves all in all. This ethereal Fire is one of the four Elements of the Ancients: It lies latent, and diſperſed thro' all the other three, and quieſcent; till collected in a Quantity, that overbalances the circumjacent; like the Air crouded into a Tempeſt; or till it is excited by any proper Motion.

This Fire gives Elaſticity, and Elaſticity, or Vibration, is the Mother of Electricity. This Fire is in Water; and betrays itſelf to our Senſes in ſalt Water. Many a time, when I have paſſed the *Lincolnſhire* Waſhes, in the Night-time, the Horſe has ſeem'd to tread in liquid Flames. The ſame Appearance oft at the Keel of a Ship.

The Operation of the ethereal Fire is various, nay infinite, according to its Quantity, and Degree of Incitement, Progreſs, Hindrance, or Furtherance. One Degree keeps Water fluid, ſays the learned Biſhop of *Cloyne:* Another turns it into elaſtic Air: And Air itſelf ſeems nothing elſe but Vapours and Exhalations render'd elaſtic, by this Fire.

This ſame Fire permeates and dwells in all Bodies, even Diamond, Flint, and Steel. Its Particles attract

attract with the greateſt Force, when approximated. Again, when united, they fly aſunder with the greateſt Celerity. All this according to the Laws preſcribed by the Sovereign ARCHITECT. This is the Life and Soul of Action, and Reaction, in the Univerſe. Thus has the Great AUTHOR provided againſt the native Sluggiſhneſs of Matter! Light, or Fire, in Animals, is what we call the animal Spirits; and is the Author of Life and Motion. But we know not the immediate Mode of muſcular Motion, any more than how, in inanimate Matter, it cauſes the Vibrations of an Earthquake.

Of this Fire the excellent *Manilius* thus writes, who lived in the Time of *Auguſtus*, *Aſtronom.* I.

Sunt autem cunctis permiſti partibus ignes,
Qui gravidas habitant fabricantes fulmina nubes,
Et penetrant terras, Ætnamque imitantur Olympo,
Et calidas reddunt ipſis in fontibus undas,
Ac ſilice in duro, viridique in cortice, ſedem
Inveniunt; cum ſilva ſibi colliſa crematur.
Ignibus uſque adeo natura eſt omnis abundans!

Which may thus be engliſhed:

Fire, univerſal Nature traverſes;
It makes the Thunderbolt in tumid Clouds;
In dire *Volcano's* penetrates the Earth;
And ſends the boiling Water from its Springs:
In hardeſt Flint, and ſofteſt Wood, it dwells;
Which, by Colliſion, ſhews itſelf in Flame.
With Fire ſo pregnant is all Nature found!

13. The great Queſtion then with us, is, how the Surface of the Earth is put into that vibratory and electric State by Heat and Drineſs? We muſt needs acquit the Internal of the Earth from the Charge of theſe ſuperficial Concuſſions. How is the ethereal Fire crouded together, or excited, ſo as to cauſe them; ſeeing, in our ordinary electrical Experiments, we make uſe of Friction?

But that Friction alone does not excite Electricity, we know, from the obvious Experiment of Flint and Steel; where the Suddenneſs of the Stroke, and Hardneſs of the Matter does it. Another Method of exciting it, is the letting off a Number of great Guns; which ſo crouds the ethereal Fire together, as to electrify glaſs Windows; obſerved by my Friend the Reverend Dr. *Stephen Hales*. The *Aurora borealis*, *auſtralis*, all kind of Coruſcation, Meteors, Lightning, Thunder, Fireballs, are the Effects, and may reciprocally be the Cauſe, of Electricity; but how, in particular, we know not.

Come we to the animal World, we muſt needs aſſert, that all Motion, voluntary and involuntary, Generation, even Life itſelf, all the Operations of the vegetable Kingdom, and an Infinity more of Nature's Works, are owing to the Activity of this electric Fire; the very Soul of the material World. And, in my Opinion, it is this alone that ſolves the famous Queſtion, ſo much agitated with the Writers in Medicine, about the Heat of the Blood. How theſe, how Earthquakes, are begun and propagated, we are yet to ſeek.

We may readily enough preſume, that the Contact between the Electric and the Non-electric, which

which gives the Snap, and the Shock, muſt come from without, from the Atmoſphere; perhaps by ſome Meteor, that crouds the ethereal Fire together, cauſes an Accenſion in the Air, in the Point of Contact, on the Earth's Surface; perhaps another time by a Shower of Rain. We may as readily conclude, that. tho' the original Stroke comes from the Atmoſphere, yet the Atmoſphere has no further Concern in it: No aereal Power, or Change therein, can propagate itſelf ſo inſtantaneouſly over ſo vaſt a Surface as 4000 Miles ſquare: Therefore the impetuous ruſhing Noiſe in the Air, accompanying the Shock, is the Effect, not the Cauſe.

But ſurely there is not a Heart of Fleſh that is not affected with ſo ſtupendous a Concuſſion. Let a Man eſtimate his own Power with that which cauſes an Earthquake, and he will be perſuaded that ſomewhat more than ordinary is intended by ſo rare and wonderful a Motion.

That great Genius *Hippocrates* makes the Whole of the Animal Oeconomy to be adminiſtred by what we call Nature; and Nature alone, ſays he, ſuffices for all things to Animals: She *knows* herſelf, and what is neceſſary for them.

Can we deny then that he here means a conſcious and intelligent Nature, that preſides over, and directs all things; moves the ethereal Spirit, or Fire, that moves all things; a divine Neceſſity, but a voluntary Agent, who gives the commanding Nod to what we commonly call Nature; the chief Inſtrument in the moſt important Operations of the vaſt Machine, as well as in the ordinary ones? And this leads us,

14. Laſtly, in regard to the ſpiritual Uſe we ought to make of theſe extraordinary *Phænomena*, or of our Inquiries about them; I ſhall firſt obſerve, that we find abroad, ſeveral of theſe Earthquakes this Year have been very fatal. In the laſt we read of at *Philippoli* in *Thrace*, the whole City was deſtroy'd, and above 4000 Inhabitants kill'd. At home, where above half a Score ſeparate Concuſſions have been felt, there has not been one Houſe thrown down, one Life loſt. This ought to inſpire us with a very ſerious Reflection about them. 2. We may obſerve, that if we did but read the Works of *Hippocrates*, *Plato*, and his Followers, of *Tully*, *Galen*, and the like ethic Writers of Antiquity, whilſt we ſtudy and try the Affections of Matter, we ſhould improve in Philoſophy, properly ſpeaking; we ſhould lift up our Minds from theſe earthly Wonders, and diſcern the celeſtial Monitions they preſent to us.

The original Meaning of the Word Philoſophy was rightly applied to moral Wiſdom: We, who have improv'd both, ſhould join them both togegether. By this means we gather the Truth of the higheſt and moſt excellent Philoſophy, to be found in thoſe Volumes of firſt Antiquity, which we call ſacred; and we ſhould adore that divine Light which they hold forth to us; eſpecially in a Country where the Principles of true Religion are open and undiſguiſed; where the eſtabliſh'd Profeſſion of it is rational, noble, and lovely; worthy of the moral Governor of the World.

W. Stukely.

PHILOSOPHICAL TRANSACTIONS,

GIVING SOME

ACCOUNT

OF THE

Present Undertakings, Studies, *and* Labours,

OF THE

INGENIOUS,

IN MANY

Considerable Parts of the WORLD.

VOL. XLVI. For the Years 1749 and 1750.

LONDON:

Printed for C. DAVIS, PRINTER to the ROYAL SOCIETY, over-against *Gray's-Inn-Gate* in *Holbourn.*

M.DCC.LII.

THIS XLVI Volume of the *Philoſophical Tranſactions* concludes thoſe publiſh'd by the late *Cromwell Mortimer*, M. D. *Secretary* of the *Royal Society*; the laſt Number being printed off juſt before his Death on the 7th of January 1752.

AN

INDEX

TO THE

Forty-ſixth VOLUME

OF THE

Philoſophical Tranſactions,

For the YEARS 1749, and 1750.

A.

Abſtracts of ſeveral Obſervations of *Auroræ Borcales*, *n.* 495, *p.* 499—505.

Acceleration of the Moon, by Rev. Mr. *Richard Dunthorne*, *n.* 492, *p.* 162.

Adee, M. D. (*Swithin*) on the Virtues of *Jeſſop's Well* Waters, *n.* 495, *p.* 451.

Agreement of Thermometers, in *London*, and at *Tooting*, *n.* 493, *p.* 208.

Air, Obſ. of the Change of its Temperature, *Nov.* 22. 1748. by Dr. *Miles*, *n.* 491, *p.* 3.

Ammonitæ, or *Cornua Ammonis*, ſome *Vertebræ*, by the ſame, *n.* 491, *p.* 37.

Amphora, the *Roman*, *n.* 491, *p.* 70.

Ancell, an antient Weight, *n.* 491, *p.* 55.

Apotheoſis, or *Beatification*, an Electrical Experiment, by Prof. *Boſe*, *n.* 494, *p.* 350.

Apple-trees, the Effects of the Mixture of their *Farina*, *n.* 493, *p.* 206.

Approach, the gradual, of the *Earth* to the *Sun*, *n.* 493, *p.* 204.
Arch, a luminous, *Febr.* 16, 1749. by Dr. *Wm. Cooper*, *n.* 497, *p.* 647.
Arderon (Mr. *Wm.*) of the *Roman* Camp at *Caſtor* in *Norfolk*, *n.* 493, *p.* 196.
——— Account of a Dwarf, *n.* 495, *p.* 467.
——— of the hot Weather in *July* 1750, *n.* 496, *p.* 573.
——— of an *Exploſion* in the Air, heard at *Norwich*, *June* 7. 1750, *n.* 497, *p.* 698.
Arithmetical Inſtrument, the *Shwan-pan*, by Mr. *Smethurſt*, *n.* 491, *p.* 22.
Arm, an extraordinary Caſe of the *Fracture* of one, by Mr. *Freke*, *n.* 494, *p.* 398.
Avoirdupois, the legal and antient Standard Weight, *n.* 491, *p.* 54. 59.
——— the Ounce the ſame as the *Roman*, *ibid. p.* 69. Whence its Name, *ib. p.* 68.
Aurora Auſtralis, ſeen at *Chelſea*, *Jan.* 23, 1749-50, by *John Martyn*, *n.* 494, *p.* 319.—*Feb.* 16, *ib. p.* 345. by the ſame.—*Jan.* 23, 1750-51, by Dr. *Henry Miles*, *ib. p.* 346.
——— *Borealis* at *Northampton*, obſ. by Dr. *Doddridge*, *n.* 497, *p.* 712.
Auror.æ Boreales, Abſtracts of ſeveral Obſervations on them, *n.* 495, *p.* 499—505.

B.

Baker (Mr. *Henry*) of ſome *Vertebræ* of *Ammonitæ*, or *Cornua Ammonis*, *n.* 491, *p.* 37.
——— of the Minuteneſs of the Seeds in ſome Plants, *n.* 494, *p.* 337.
——— Abſtracts of ſeveral Obſervations of *Auroræ Boreales*, *n.* 495, *p.* 499—505.
——— of an Earthquake at *London*, *Feb.* 8, 1749-50, *n.* 497, *p.* 601.—*March* 8, 1749-50, *ib. p.* 617.—at *Winbourn* in *Dorſetſhire*, *May* 4, 1749, *ib. p.* 689.
Ball of Fire in the Air, *n.* 497, *p.* 728.

Barker, Esq; (*Tho.*) of an extraordinary Meteor seen in *Rutlandshire* 1749, *n.* 493, *p.* 248.
Barlow (Rev. Mr. *Wm.*) of an Earthquake at *Plymouth*, *Feb.* 8. 1749-50, *n.* 497, *p.* 692.
Barometer and Thermometer, with their Extremes, at *Tooting*, 1749, *n.* 493, *p.* 211.—in *London*, *ib. p.* 213.
——— the State of them on the 8th of *Feb.* 1749-50, in *London*, *n.* 497, *p.* 608.—at *Tooting*, *ib. p.* 609.
Barometrorum cum aeris & tempestatum mutationibus consensus, *a S. C. Holmanno*, *n.* 492, *p.* 101.
Barrel, a Beer Measure, *n.* 491, *p.* 55.
Barrow, Esq; (*James*) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 626.—near *Bury St. Edmund's* in *Suffolk*, *Sept.* 30, 1750, *ib. p.* 702.
Bartram (Mr. *John*) Obs. on the Dragon-fly, or *Libella* of *Pensilvania*, *n.* 494, *p.* 323. 400.
Bas-relief of *Mithras*, explained by Dr. *Stukely*, *n.* 493, *p.* 215.
Baster, (*Joh.*) *Descriptio Fatus monstrosi*, *n.* 495, *p.* 479.
Beatification, an electrical Experiment, by Prof. *Bose*, *n.* 494. *p.* 350.
Bees of, and their Method of gathering Wax and Honey, *n.* 496, *p.* 536.
Berlin, a *Solar* Eclipse there *Jan.* 8, 1750, obs. by Mr. *Grischow* and Mr. *Kies*, *n.* 494, *p.* 339.
Bevis, M. D. (*John*) Obs. of a *Lunar* Eclipse 1749, at Mr. *Graham's* in *Fleet-street*, *n.* 493, *p.* 247.—of the total Eclipse of the *Moon*, *Dec.* 2, 1750, *n.* 496, *p.* 575.
Bezoar of Rhinoceros, *n.* 492, *p.* 120.
Bills of Paper-money current among the *Chinese*, *n.* 494, *p.* 330.
Birch (the Rev. Mr. *Tho.*) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 615.
Blackhouse (*John*) had a *Calculus* under his *Præputium*, *n.* 491, *p.* 46.
Black Vomit, *n.* 492, *p.* 135.
Bladder, a Tumour on the Inside thereof extirpated by *Joseph Warner*, *n.* 495, *p.* 414.

Blondeau, Esq; (——) Remarks on the Paintings at *Herculaneum*, *n.* 491, *p.* 14.
Borlace's (the Rev. Mr. *Wm.*) Enquiry into Spar, and Sparry Productions, *n.* 493, *p.* 250.
Bose (Mr. *Geo. Matthias*) on the Electricity of Glass, *n.* 492, *p.* 189.
——— of the *Apotheosis* or *Beatification* by Electricity, *n.* 494, *p.* 350.
——— *de Eclip. lunar. Wittemb.* 19 *Jan.* 1750, *n.* 496, *p.* 570.
Bowman, Esq; (*Walter*) of an Earthquake at *East Moulsey* in *Surry*, *March* 8, 1749-50, *n.* 497, *p.* 684.
Boyfield (Mr.) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 637.
Boza (Mr. *Claude Gros de*) Reflections on the Medals of *Pescennius Niger*, *n.* 495, *p.* 452.
Bridport, of an Earthquake there, *March* 18, 1749-50, *n.* 497, *p.* 688.
Burning of the Steeple at *Danbury* in *Essex*, by Lightning, *n.* 497, *p.* 611.
Burrat (*Tho.*) of an Earthquake at *Kensington*, *March* 8, 1749-50, *n.* 497, *p.* 681.
Burrow, Esq; (*James*) of an Earthquake in *London*, *March* 8, 1749-50, from Mr. *Boyfield*, *n.* 497, *p.* 637.—at *East-Sheen* in *Surry*, *ib. p.* 655.
Burton, M. D. (*John*) of the Extirpation of an Excrescence from the Womb, *n.* 495, *p.* 520.
Bury St. *Edmund's* in *Suffolk*, of an Earthquake near that Place, *Sept.* 30, 1750, *n.* 497, *p.* 702.
Bushel, the *London*, *n.* 491, *p.* 55.—the *Winchester*, *ibid. p.* 56.
Butt of Wine, &c. *n.* 491, *p.* 55.

C.

Cadaver apertus, & sternus gibbosus, per Jo. Jac. Huber, M. D. *n.* 492, *p.* 92.
Calculus, or Stone, one between the *Glans* and the *Præputium* of a Boy, *n.* 491, *p.* 45.—of a very large human, *n.* 496, *p.* 596.

Carlsbad,

Carlsbad, the hot Springs there, *n.* 493, *p.* 219.
Caſtor in *Norfolk*; of the *Roman* Camp there, *n.* 492, *p.* 219.—the *Ruſſia*, from what Animal, *n.* 493, *p.* 217.
Cat, M. D. (*Caud. Nic. le*) of a new Contrivance of Glaſſes for Things in ſpirituous Liquors, *n.* 491, *p.* 6.
——— of the Cure of dry Gangrenes, *ib. p.* 72. 80.
——— Operation of Lithotomy on Women, *n.* 492, *p.* 97.
Catalogue of the 50 Plants from *Chelſea* Garden, for the Year 1747, by Dr. *John Wilmer*, *n.* 494, *p.* 331.—for the Year 1748, *ib. p.* 359.—for the Year 1749, *n.* 495. *p.* 403.
Catlin (Mr. *John*) of a *Lunar* Eclipſe, *June* 8, 1750, *n.* 496, *p.* 523.
Cave, Bart. (Sir *Thom.*) of an Earthquake at *Stanford Hall* *Sept.* 30, 1750. *n.* 497, *p.* 706.
Chalmers (Mr.) of an extraordinary Fire-ball burſting at Sea, *n.* 494, *p.* 366.
Chauncy (Mrs.) who had a Stone under her Tongue, *n.* 491, *p.* 5.
Chelſea, an *Aurora Auſtralis* there, *Jan.* 20, 1749-50. ſeen by *John Martyn*, *n.* 494, *p.* 319.
———of an Earthquake there, *Feb.* 8, 1749-50. *n.* 497, *p.* 609.
Cheſter, of an Earthquake there, *April* 2, 1750. *n.* 497, *p.* 683.
Chineſe Accompt Table, or *Shwan-pan*, a new one, by Mr. *Smethurſt*, *n.* 491, *p.* 22.
———have Paper Money current among them, *n.* 494, *p.* 330.
———their Knowlege of Geography, *ib. p.* 328.
Clare, Eſq; (*Martin*) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 620.
Clarke (the Rev. *Rob.*) of a Boy who had a *Calculus* under the *Præputium*, *n.* 491, *p.* 45.
Clove, a Weight, *n.* 491, *p.* 66.
Cometa viſus Pekini, 1748, *& obſ. ab Aug. Hallerſtein*, *n.* 494, *p.* 307.—*ab Ant. Gaubil*, ib. p. 316.
Compaſs Mariners, deſtroy'd by the Effects of Lightning, *n.* 492, *p.* 111.—contrived by *Gowin Knight*, M. B. *n.* 495, *p.* 505.

Condamine

Condamine (Dom. *de la*) *de Declinatione quarundam Stellarum Auſtralium, menſe Junio* 1738. *n.* 492, *p.* 159.
Congius, a Meaſure of *Veſpaſian*, *n.* 491, *p.* 70.
Conjunctio Martis & Veneris Pekini Sinar. *menſe Mart.* 1748. *n.* 494, *p.* 314. 319.
Conſtellatio nova, obſ. Pekini, 29 *Maii* 1748. *n.* 494, *p.* 311.
Contraction of the Orbits of Planets, by Mr. *Euler*, ib. *p.* 356.
Cooke (Mr. *Benj.*) of the Mixture of the *Farina* of Apple-trees, *n.* 493, *p.* 205.—of the Mayze or *Indian* Corn, *ib. p.* 206.
———of a Child born with the Jaundice upon it, *ibid. p.* 207.
———of an Earthquake in the *Iſle of Wight*, *March* 1, 1749-50, *n.* 497, *p.* 651.
Cooper, D. D. (Rev. *Wm.*) of the Earthquake on *March* 8, 1749-50, *n.* 497, *p.* 647.
———of the luminous Arch, *Feb.* 16, 1749-50, *ibid. p.* 648.
Corniſh Diamonds, an Inquiry into, *n.* 493, *p.* 251, *&c.*
Coſta (Mr. *Eman. de*) of two beautiful Echinites, *n.* 492, *p.* 143.
Cracau, of the Salt Mines near that Place, *n.* 493, *p.* 228.
Crux Auſtralis, ad inveniendum horam in mari noctu, *n.* 492, *p.* 141.
Cryſtals, or *Spars*, found in the *Corniſh* Mines, *n.* 493, *p.* 251, *&c.*
Cycle, or *Golden Number*, Remarks upon, by the Earl of *Macclesfield*, *n.* 495, *p.* 418.

D.

Danbury in *Eſſex*, its Steeple burnt by Lightning, *n.* 497, *p.* 611.—the Church is enter'd by the Devil, or Frier, *ib. p.* 612.
Daval, Eſq; (*Peter*) of an extraordinary Rainbow, *July* 15, 1748, *n.* 493, *p.* 193.
Day, a very cold, in *June* 1749. *n.* 493, *p.* 208.—a very hot in *July* 1749. *ibid.*
Deen in *Northamptonſhire*, of an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 721.

Deſcriptio fœtus ſine ullo ſexus ſigno, *n.* 495, *p.* 479.
Deſcription of a Mariners *Compaſs*, contrived by *Gowin Knight*, *ib. p.* 505-512.
——— of a *Fiſh*, by Dr. *Mortimer*, *ib. p.* 518.
Diamonds, *Corniſh*, an Enquiry into, *n.* 493, *p.* 251, *&c.*
——— true, of their Properties, *ib. p.* 272.
Dimenſions of a Dwarf, and of a Child, by *David Erſkine Baker*, *n.* 495, *p.* 467.
Dobbs, Eſq; (*Arthur*) of Bees, and their Method of gathering Wax and Honey, *n.* 496, *p.* 536.
Doddridge, D. D. (Rev. *P.*) of an Earthquake at *Northampton*, *n.* 497, *p.* 712.
Dog, a mad, bites an Horſe, *n.* 495, *p.* 474.
Downe (Mr. *Nath.*) of an Earthquake at *Bridport*, *March* 18, 1749-50. *n.* 497, *p.* 688.
Dragon Fly, Obſervations thereon, by Mr. *John Bartram*, *n.* 494, *p.* 323.
Dudley Foſſil, deſcribed by Dr. *Lyttelton*, *n.* 496, *p.* 599.
——————— by Dr. *C. Mortimer*, *ib. p.* 600.
Dunthorne (Rev. Mr. *Richard*) Acceleration of the Moon, *n.* 492, *p.* 162.
Dwarf, an Account of one, by Mr. *Wm. Arderon*, *n.* 495, *p.* 467.

E.

Earith in *Huntingdonſhire*, of a *Lunar* Eclipſe, *Dec.* 12, 1749. obſ. by Mr. *Wm. Elſtob* jun. *n.* 493, *p.* 280.
Earth, her gradual Approach to the Sun, *ib. p.* 204.
Earthquake at *London*, *Feb.* 8, 1749-50, by Mr. *H. Baker*, *n.* 497, *p.* 601.—by *Gowin Knight*, *ib. p.* 603.—by *Jo. Freeman*, Eſq; *ib. p.* 605.—at *Eltham* in *Kent*, by *Wm. Fauquir*, *ib. p.* 606.—at *Tooting*, by the Rev. Dr. *Miles*, *ib. p.* 607.—at *Chelſea*, by Dr. *John Martyn*, *ib. p.* 609.—at *Harwich*, by Mr. *Trembley*, *ib. p.* 610. at *Aldersbrook*, by *Smart Lethueillier*, Eſq; *ib. p.* 613. at *Plymouth*, by Rev. Mr. *Wm. Barlow*, *ib. p.* 692.
———at *London*, *March* 8, 1749-50. by *Martin Folks*, Eſq; *Pr. R. S. n.* 497. *p.* 613.—by Rev. Mr. *Birch*, *ib. p.* 615.—by Mr. *Henry Baker*, *ib. p.* 617.—by Dr. *Layard*,

Layard. ib. p. 621.—by Mr. *Roger Pickering, ib. p.* 622.—by *Robert Shaw, ib. p.* 626.—by *Mich. Ruſſel*, Eſq; *ib. p.* 631.— by Dr. *Parſons, ib. p.* 633.— by Mr. *Boyſield, ib. p.* 637.—by Dr. *Mortimer, ib. p.* 638. and by Rev. Dr. *Cooper, ib. p.* 647.

Earthquake at *Tooting, March* 8, 1749-50, by Dr. *Miles, n.* 497, *p.* 619. 628. 639.—at *Kenſington* Gravel-Pits, by *Martin Clare*, Eſq; *ib. p.* 620.—at *Chelſea*, by Dr. *Martyn, ib. p.* 630.—at *Portſmouth, March* 18, by Mr. *Ellicott, ibid. p.* 646. by *Dan. Wray*, Eſq; *ibid. p.* 647; and by the Rev. Mr. *Taylor, ib. p.* 649.—in the *Iſle of Wight, March* 19. by Mr. *Benj. Cooke, ib. p.* 651.—at *Southampton*, and thoſe Parts, *March* 18 and 19, by *Joſiah Colebrooke, ib. p.* 652.—at *Hackney* near *London, March* 18, by Mr. *Peter Newcome, ib. p.* 653.—at *Eaſt Sheen* in *Surry, March* 18, by *James Burrow*, Eſq; *ib. p.* 655.—at *Kenſington*, by *Tho. Burrat, ib. p.* 681.—at *Cheſter, April* 2, by *Robert Paul*, Eſq; *ib. p.* 683.—at *Eaſt Mouliey, March* 14, by *Walter Bowman*, Eſq; *ib. p.* 684.—in *Flintſhire, April* 2, by Mr. *Pennant, ib. p.* 687.—at *Bridport, March* 18, by Mr. *Nath. Downe, ib. p.* 688.—at *Winbourn* in *Dorſetſhire, May* 4, 1749, by Mr. *Henry Baker, ib. p.* 689.—in *France, Octob.* 11, 1749, by M. de *Reaumur, ib. p.* 691.—at *Warrington* in *Lancaſhire, April* 2, by Mr. *Ph. Warburton, ib. p.* 696.—at *Newton* in *Northamptonſhire, Sept.* 30. by *Wm. Folkes*, Eſq; *ib. p.* 701.—near *Bury St. Edmund's* in *Suffolk*, and at *Narborough* in *Leiceſterſhire, Sept.* 30, by *James Burrow*, Eſq; *ib. p.* 702. 704.—in *Northamptonſhire, Sept.* 30, by Rev. Mr. *John Nixon, ib. p.* 705. 710. by *Tho. Cave, ib. p.* 706. by the Rev. Miniſter of *Weſton with Sutton, ib. p.* 707. by the Rev. Dr. *Doddridge, ib. p.* 712. by Mr. ——, *ib. p.* 721; and by Mr. *Wm. Smith, ib. p.* 727.—in *Leiceſterſhire, Sept.* 30, by Mr. *Henry Green, ib. p.* 723.—in *Lincolnſhire, Aug.* 23, by *Maurice Johnſon*, Eſq; and Dr. *John Green, ib. p.* 725.

Earthquakes

Earthquakes happen uſually in the Spring and Autumn, *n.* 497, *p.* 624, 625.
——————the Cauſes of, by Mr. *Stukely*, *ib. p.* 641—646. 657. and by Dr. *Steph. Hales*, *ib. p.* 669.
——————at *Smyrna*, by Dr. *Mackenzie*, *n.* 497, *p.* 700.
——————the Philoſophy of, by Dr. *Wm. Stukely*, *ibid. p.* 731, *&c.*
Eaſter, the Method of finding the Time of; by the Earl of *Macclesfield*, *n.* 495, *p.* 426.
Echinites, two beautiful, by Mr. *Eman. de Coſta*, *n.* 492, *p.* 143.
Eclipſe of the *Moon*, *Dec.* 12, 1749. obſ. at Mr. *Graham's* in *Fleet ſtreet*, by *John Bevis*, M. D. and Mr. *James Short*, *n.* 493, *p.* 247.—at *Erith* in *Huntingdonſhire*, by Mr. *Wm. Elſtob* jun. *ib. p.* 280.—at *Rome*, by Mr. *Chriſtoph. Maire*, *n.* 494, *p.* 322.
——————total of the *Moon*, *Dec.* 2. 1750. obſ. by Dr. *Bevis* and Mr. *James Short*, *n.* 496, *p.* 575.
——————of the *Sun*, *Jan.* 8, 1750. obſ. at *Rome*, by Mr. *Chriſtoph. Maire*, *n.* 494, *p.* 322.—at *Berlin*, by Mr. *Griſchow* jun. and Mr. *Kies*, *ib. p.* 339.—in *Surry-ſtreet* in the *Strand*, by Mr. *John Catlin*, and Mr. *Jam. Short*, *n.* 496, *p.* 523.
Eclipſes, obſerved at *Grand Cairo*, *n.* 492, *p.* 164.
Eclipſis lunaris totalis Wittembergæ, 19 *Junii* 1750. *obſ. per G. M. Boſe*, *n.* 496, *p.* 570.
Effervescence of Steel accounted for, by Dr. *le Cat*, *n.* 492. *p.* 185.
Electrical Phænomena examined, by Abbé *Nollet*, *n.* 494, *p.* 370.
Electricity cannot make Odours paſs through Glaſs, *n.* 494, *p.* 349.
Ellicott (Mr. *John*) of Experiments made about the Aſcent of Rockets, *n.* 496, *p.* 578.
——————of an Earthquake at *Portſmouth*, *March* 18, 1749-50. *n.* 497, *p.* 646.
Elſtob jun. Obſ. of a *Lunar* Eclipſe at *Erith* in *Huntingdonſhire*, *Dec.* 12, 1749, *n.* 493, *p.* 280.

Eltham in *Kent*, of an Earthquake there, *Feb.* 8, 1749-50. *n.* 947, *p.* 606.
Emerſions of the *Satellites* of *Jupiter*, for the Year 1751. by *James Hodgson*, *n.* 493, *p.* 282.
Epacts, Remarks upon, by the Earl of *Macclesfield*, *n.* 495, *p.* 421.
Ephemeris Cometæ viſi Pekini Sinar. 1748, *n.* 494, *p.* 307.
Epiſtola de Cadavere aperto, & de Sterno gibboſo, à Jo. Jac. Hubero, M. D. *n.* 492, *p.* 92.
Equatorial Teleſcope, a Deſcription of one, by Mr. *Jam. Short*, *n.* 493, *p.* 242.
Euler, P. M. (*Leonard*) of the gradual Approach of the *Earth* to the *Sun*, *n.* 493, *p.* 204.
——of the Contraction of the Orbits of the Planets, *n.* 394, *p.* 356.
Examination of certain *Phænomena* in Electricity, *n.* 494, *p.* 368.
Experimenta ad reſpirationem pertinentia; *per Alb. Haller*, M. P. *n.* 494, *p.* 325.
Experiments on Subſtances reſiſting Putrefaction, by Dr. *Pringle*, *n.* 495, *p.* 480. 525. 550.—About the Aſcent of Rockets, by *Sam. de Coſta*, and others, *n.* 496. *p.* 478.
Exploſion in the Air, heard at *Norwich*, *June* 7, 1750, by Mr. *W. Arderon*, *n.* 497, *p.* 698.
Extirpation of a Tumour in the Bladder, by Mr. *Joſeph Warner*, *n.* 495, *p.* 417.—of an Excreſcence from the Womb, by Dr. *John Burton*, *ib. p.* 520.

F.

Fabricæ morboſæ in cadaveribus repertæ hiſtoriæ aliquæ, ab Alb. Haller, *n.* 492, *p.* 172.
Farina of Apple-trees, the Effects of the Mixture of, *n.* 493, *p.* 205.
Fauquier, Eſq; (*William*) of an Earthquake at *Eltham* in *Kent*, *Feb.* 8, 1749-50, *n.* 497, *p.* 605.
Feet, turned inwards in the Birth, brought to rights, *n.* 493, *p.* 240.
Fermentation of Steel accounted for, *n.* 492, *p.* 185.

Fire-

Fire-ball, an extraordinary, burſting at Sea; obſ. by Mr *Chalmers*, *n.* 494, *p.* 366.
Fire-wood, of the green Mould thereon, *n.* 494, *p.* 324.
Fiſh leap out of the Water, *n.* 497, *p.* 637.
Flintſhire, of an Earthquake there, *April* 2, 1750, *n.* 497, *p.* 687.
Fœtus in utero differently affected by the Small-Pox, *n.* 493, *p.* 235.
——*monſtroſi Deſcriptio, per Joh. Faſter*, *n.* 495, *p.* 479.
Folkes, Eſq; (*Martin*) *Pr.* R. S. of an Earthquake at *London*, *March* 8. 1749-50, *n.* 497, *p.* 613.
——(*Wm.*) of an Earthquake at *Newton* in *Northamptonſhire*, *Sept.* 30, 1750, *ib. p.* 701.
Forceps for the Extirpation of Tumours too remote from the Surgeons Fingers; by Dr. *le Cat*, *n.* 491, *p.* 80.
——for extracting Stones, and other foreign Bodies, where the common are of no Uſe, *ib. p.* 84.
Fort River, irregular Tide there, *n.* 495, *p.* 412.
Fournaiſe (Mrs.) cured of a *dry Gangrene*, *n.* 491, *p.* 74.
Fracture of the Arm, an extraordinary Caſe of, by Mr. *John Freke*, *n.* 494. *p.* 398.
France, of an Earthquake there, *Oct.* 11, 1749, *n.* 497, *p.* 691.
Freeman, Eſq; (*Wm.*) of a Stone under the Tongue of a Clergyman's Lady, *n.* 491, *p.* 5.
——of an Earthquake at *London*, *Feb.* 8, 1749-50, *n.* 497, *p.* 605.
Freke (Mr.) an extraordinary Caſe of a Fracture of the Arm, *n.* 494, *p.* 397.

G.

Gallon Wine, *n.* 491, *p.* 55. Ale, *ib. p.* 59.
Gangrenes dry, of their Cure, by Dr. *le Cat*, *n.* 491, *p.* 72.
Garcin, M. D. (*Laurence*) of the *Salvadora*, a new Genus of Plants, *n.* 491, *p.* 47.
Gaubil (*Rev. P. P. Anton.*) *de Cometa viſo* Pekini, 1748. *n.* 394, *p.* 316.
—— of the Knowlege of Geography among the *Chineſe*, *n.* 494, *p.* 327.

Glaſs, Electricity of, *n.* 492, *p.* 189.
——admits not Odours to paſs through it by Electricity, *n.* 494, *p.* 349.
Glaſs-drops, a Memoir on, by Dr. *le Cat*, *n.* 492, *p.* 175.
Glaſſes for preſerving Things in Spirits, a new Invention, *n.* 491, *p.* 6, 88.
Globes, large, prepared by Mr. *John Senex*, are ſold by his Widow, *n.* 423, *p.* 290,
Glory, or *Beatification*, by Electricity, *n.* 494, *p.* 350.
Golden Number, Remarks upon by the Earl of *Macclesfield*, *n.* 495, *p.* 418.
Graham's in *Fleet-ſtreet*, Obſ. of a *Lunar* Eclipſe there, by Dr. *J. Bevis*, and Mr. *James Short*, *n.* 493, *p.* 247.
Grand Cairo, Eclipſes obſerved there, *n.* 492, *p.* 165.
Greek Inſcription, explained by *J. Ward*, *n.* 495, *p.* 488.
Green (Mr. *Henry*) of an Earthquake, *Sept.* 30, 1750, *n.* 497, *p.* 721.
——Dr. *John*, of an Earthquake at *Spalding* in *Lincolnſhire*, *Aug.* 23, 1750, *n.* 497, *p.* 725.
Griſchow's jun. (Mr.) Obſ. of a *Solar* Eclipſe at *Berlin*, *Jan.* 8, 1750, *n.* 404, p. 339.

H.

Hackney near *London*, of an Earthquake there, by Mr. *Peter Newcome*, *n.* 497, *p.* 653.
Hales, D. D. (Rev. *Steph.*) Examination of the Strength of the principal Purging Waters, *n.* 495, *p.* 446.
——on the Cauſes of Earthquakes, *n.* 497, *p.* 669.
Halleri, M. P. (*Alberti*) *Fabricæ morboſæ in cadavere repertæ hiſtoriæ aliquæ*, *n.* 492, *p.* 170.
——*Experimenta ad reſpirationem pertinentia*, *n.* 494, *p.* 325.
——*de viis ſeminis*, *n.* 494, *p.* 340.
Hallerſtein (*Auguſtin.*) *Obſ. Cometæ viſi* Pekini, 1748. *n.* 494, *p.* 305.
Halley's (Dr.) Demonſtration of the Analogy of the Logarithms, Tangents, &c. explained by Mr. *John Robertſon*, *n.* 496, *p.* 559-569.
Halo, or *Mock Sun*, obſ. by Mr. *Wm. Arderon*, *n.* 493, *p.* 203.

Harwich,

Harwich, of an Earthquake there, *Feb.* 8, 1749-50, *n.* 497, *p.* 610.
Heat of the Weather in *July* and *September*, 1750, by Dr. *Baker*, *n.* 496, *p.* 571.—Extraordinary in *February*, 1749-50, *n.* 497, *p.* 619.
Heberden, M. D. (*Wm.*) of a very large human *Calculus*, *n.* 496, *p.* 596.
Herculaneum, Remarks on the Paintings there, by Mr. *Blondeau*, *n.* 491, *p.* 14.
Hexagonal Shape of Spars, whence, *n.* 493, *p.* 264.
Hodgson (*James*) Immerſions and Emerſions of *Jupiter*, for the Year 1751, *n.* 493, *p.* 282—289.
Hogshead, a Meaſure, *n.* 491, *p.* 55.
Holmannus (*Sam. Chriſtian.*) *de Barometrorum cum aeris & tempeſtatum mutationibus conſenſu*, *n.* 492, *p.* 101.
Honey and Wax, how gathered by the Bees, *n.* 496, *p.* 536.
Horſe bit by a mad Dog, *n.* 495, *p.* 474.
Hour of the Day, how to find, *n.* 493, *p.* 244.
Huberus, M. D. (*Joh. Jac.*) *de cadavere aperto, & de ſterno gibboſo*, *n.* 492, *p.* 92.
Hundred, a Weight, *n.* 491, *p.* 66.
Huxham, M. D. (*John*) Obſ. on the Northern Lights, ſeen *Feb.* 15 and 16, 1749-50, *n.* 495, *p.* 472.

J.

Jaundice, a Child born with, *n.* 493, *p.* 207.
Jeſſop's Well Purging Water examined, *n.* 495, *p.* 447-451.
Immerſions and *Emerſions* of the *Satellites* of *Jupiter*, for the Year 1751. by *James Hodgſon*, *n.* 493, *p.* 282.
Impoſtume, an extraordinary in a Lady's Stomach, *n.* 495, *p.* 406.
Improvements of Dr. *Knight*'s Mariners Compaſs, by *John Smeaton*, *n.* 495, *p.* 513.
Incruſtations of Spars, or Cryſtals, *n.* 493, *p.* 259.
Indian Corn, the Effect of the Mixture of its *Farina*. *n.* 493, *p.* 206.
Inſcription, a *Roman*, remarked upon by Mr. *John Ward*, *n.* 494, *p.* 293.

Inſcription, an antient *Greek*, explained by *John Ward*, *n.* 495, *p.* 488.
Inſect, a petrified, deſcribed by Dr. *Lyttelton*, *n.* 496, *p.* 598.
Inundation, a ſurpriſing in *Cumberland*, 1749, *n.* 494, *p.* 362.
Jovis & Veneris Congreſſus Pekini, *Jan.* 1, 1748, *n.* 494, *p.* 315.
Iſle of Wight, of an Earthquake there, *March* 19, 1749-50, *n.* 497, *p.* 651.
Italy, Travels through, by *Rob. More*, Eſq; *n.* 495. *p.* 464.

K.

Kenſington, of an Earthquake there, *March* 8, 1749-50. *n.* 497. *p.* 681.
Kies, (M.) of an Eclipſe of the *Sun*, *Jan.* 8, 1750, obſ. at *Berlin*, *n.* 494. *p.* 339.
Kingſton in *Jamaica*, its Longitude determined, *n.* 496, *p.* 523.
Knight, M. B. (*Gowin*) Remarks on the Effects of Lightning, in deſtroying the Polarity of a Mariners Compaſs, *n.* 492, *p.* 113.
———Contrivance of a Mariners Compaſs, *n.* 495, *p.* 505.
———His Mariners Compaſs improved by *John Smeaton*. *n.* 495, *p.* 513.
———of an Earthquake at *London*, *Feb.* 8. 1749-50, *n.* 497, *p.* 603.
Knowlege of Geography among the *Chineſe*, *n.* 494, *p.* 328.

L.

Lacrymæ Batavicæ, a Memoir on, by Dr. *le Cat*, *n.* 492, *p.* 175.
Lambeth; of *John Tradeſcant*'s Garden there, by Mr. *W. Watſon*, *n.* 492, *p.* 160.
———Part of a Roof flung down there by an Earthquake, *March* 8, 1749-50, *n.* 497, *p.* 700.
Lateral Operation for the Stone; a Propoſal to remove its Defects, *n.* 491, *p.* 24.
Layard, M. D. (*Daniel Peter*) of an extraordinary *Impoſtume* in a Lady's Stomach, *n.* 495, *p.* 406.

Layard,

Layard, M. D. *(Peter Daniel)* of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497. *p.* 621.
Leiceſterſhire, of an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 723.
Lethieullier Eſq; *(Smart)* of the Burning of the Steeple at *Danbury*, by Lightning; and of the Earthquake, *n.* 497, *p.* 611.
Libella, or *May Fly* of *Penſilvania*; Obſ. thereon, by Mr. *John Bartram*, *n.* 494, *p.* 323, 401.
Life of *Peſcennius Niger*, with ſome Circumſtances in the Hiſtory thereof; by Monſ. *de Boze*, *n.* 495. *p.* 452.
Light of Rockets, at what Diſtance it may be ſeen, *n.* 496, *p.* 578.
Lightning; its Effects in deſtroying the Polarity of a Mariners Compaſs, *n.* 492, *p.* 111.
——— burns the Steeple at *Danbury* in *Eſſex*, *n.* 497, *p.* 611.
Lithotomy on Women, the Operation of, by Dr. *le Cat*, *n.* 492, *p.* 97.
Locuſts, of the Damage they did in *Walachia*, *Moldavia*, and *Tranſilvania*, in 1747 and 1748; and in *Hungary* and *Poland* in 1748, *n.* 491, *p.* 30.
Logarithmic Tangents analogous to the Meridian Line, *n.* 496, *p.* 559.
London, of an Earthquake there, *Feb.* 8, 1749-50, *n.* 497, *p.* 601. 603. 605.
Longitude of *Kingſton* in *Jamaica* determined. *n.* 495, *p.* 523.
Luminous Arch *Feb.* 16, 1749. obſ. by Dr. *Cooper*, *n.* 497, *p.* 647.
Lunar Year, Remarks upon, by the Earl of *Macclesfield*, *n.* 495, *p.* 418.
Lunæ Eclipſis, *obſ. in Paraquaria*, *Feb.* 24, & *Aug.* 19, 1747, *n.* 491, *p.* 8.
——— *Julii* 28, 1748, *obſ. Madriti*, *n.* 491, *p.* 10.
Lunæ & Martis Occultatio, Pekini, *Dec.* 6, 1747, *n.* 493, *p.* 312.
Lyttelton, LL. D. (Rev. *Charles)* of a non-deſcript petrified Inſect, *n.* 496, *p.* 598.

M.

Macclesfield (Earl of) Remarks upon the Solar and Lunar Years, *&c. n.* 495, *p.* 417—434.
Mackenzie (Mr. *Murdock*) of the Tides in *Orkney*, *n.* 492, *p.* 149.
———of Earthquakes at *Smyrna*, *n.* 497, *p.* 700.
Maire (Mr. *Chriſtopher*) Obſ. of the Eclipſe of the *Moon*, *Dec.* 23, 1749; and that of the *Sun*, *Jan.* 8, 1750, *n.* 494, *p.* 321.
Manna, the Method of gathering it near *Naples*, *n.* 495, *p.* 470.
Mariners Compaſs, contrived by *Gowin Knight*, *n.* 495, *p.* 505.
———————propoſed by Dr. *Knight*, improved by *J. Smeaton*, *n.* 495, *p.* 513.
Mark, a Weight, *n.* 491, *p.* 65.
Martis & Lunæ Occultatio Pekini, *Dec.* 6, 1747, *n.* 494, *p.* 312.
Martis & Veneris Conjunctio Pekini, *menſe Martio* 1748. *ibid. p.* 314.
Martyn, M. D. (*John*) of an *Aurora Auſtralis*, ſeen at *Chelſea*, *Jan.* 23, 1749-50. *n.* 494, *p.* 319.
———of an *Aurora Borealis*, *Feb.* 16, 1749-50, *n.* 494, *p.* 345.
———of an Earthquake at *Chelſea*, *Feb.* 8, 1749-50, *n.* 497, *p.* 609.—*March* 8, 1749-50, *ib. p.* 630.
May Flies of *Penſilvania*, by Mr. *John Bertram*, *n.* 494, *p.* 401.
Mayze, the Effects of the Mixture of its *Farina*, *n.* 493, *p.* 206.
Meaſures of Capacity, of the *Engliſh*, by Mr. *Reynardſon*, *n.* 491, *p.* 54. *Roman*, *ib. p.* 70.
——— dry, *n.* 491, *p.* 65.
Medals of *Peſcennius Niger*, Reflections on: *n.* 495. *p.* 452.
Meridian of a Place, how to find, *n.* 493, *p.* 244.
———-Line or Sum of the Secants, analogous to Logarithmic Tangents, *n.* 496, *p.* 559.
Meteor, an extraordinary, ſeen in *Rutlandſhire*, 1749, *n.* 493, *p.* 248.

Miles, D. D. (Rev. *Henry*) of Thermometers, and of the Weather, *n.* 491, *p.* 1.—of ſome *Vertebræ* of *Ammonitæ*, *ib. p.* 37.—of a very cold Day, and another very hot Day, in *June* and *July* 1749, *n.* 493, *p.* 208.—of the green Mould on Fire-wood, *n.* 494, *p.* 334.—of an *Aurora Borealis*, *Jan.* 23, 1750-51, *ib. p.* 346.—of the Heat of the Weather in *July* and *September* 1750, *n.* 496, *p.* 571.—of an Earthquake at *Tooting*, *Feb.* 8, 1749-50, *n.* 497, *p.* 607. *March* 8, 1749-50, *ib. p.* 628.—State of the Barometer and Thermometer at *London* and *Tooting*, *Feb.* 8, 1749-50, *n.* 497, *p.* 608, 609. of extraordinary Heat in *February*; and of the Earthquake in that Month, 1749-50, *ib. p.* 619.—of an Earthquake *Sept.* 30, 1750, *ibid. p.* 726.

Miller (Mr. *Joſ.*) a Catalogue of the 50 Plants from the Apothecaries Company, for 1746, *n.* 491, *p.* 43.

Milner, Eſq; (*Wm.*) Caſe of *Nic. Recks*'s being born with his Feet inwards, and brought to rights, *n.* 493, *p.* 239.

Mines in *Cornwall* have *Spar*, or *Cryſtals*, *n.* 493, *p.* 250.

——their Direction in them. *ib. p.* 275.

Mithras, a Bas-relief of, found at *York*, *n.* 493, *p.* 214.

Mock Sun, obſ. at *Norwich*, *n.* 493, *p.* 203.

Moleſey. See *Eaſt Moleſey*.

Moneyer's Pound. *n.* 491, *p.* 67.

Monnier (*Tho. le*) cured of a dry Gangrene. *n.* 491, *p.* 77.

Moon, of her Acceleration; by the Rev. Mr. *Dunthorne*, *n.* 492, *p.* 162.

Morbus Strangularius, by Dr. *John Starr*, *n.* 495, *p.* 436—446.

More, Eſq; (*Robert*) Remarks in his Travels thro' *Italy*, *n.* 495, *p.* 464.

——Method of gathering Manna near *Naples*, *n.* 465, *p.* 470.

Mortimer, M. D. (*Cromwell*) Caſe of a Lady, touching the Small-Pox, *n.* 493, *p.* 233.—Deſcription of a Fiſh, *n.* 495, *p.* 518.—of a ſmall flat ſpheroidal Stone, *n.* 496, *p.* 602.*

Mould, of the green, on Fire-wood, *n.* 494, *p.* 334.

Mounsey, M. D. (*James*) of the *Russia* Castor, *n.* 493, *p.* 217.
Mudge (Mr. *John*) a Proposal to remove the only real Defect in the lateral Operation for the Stone, *n.* 491, *p.* 24.

N.

Naples, the Method of gathering Manna near that Place, *n.* 495, *p.* 470.
Narborough in *Leicestershire*, of an Earthquake there *Sept.* 30, 1750, *n.* 497, *p.* 704.
Newcome (Mr. *Peter*) of an Earthquake at *Hackney* near *London*, *March* 18 and 19, *n.* 497, *p.* 653.
Newton in *Northamptonshire*, of an Earthquake there *Sept.* 30, 1750. *n.* 497, *p.* 701.
Nixon (Rev. Mr. *John*) of an Earthquake *Sept.* 30, 1750, *n.* 497, *p.* 706. 710. 728.
Nollet (l'Abbé) Examination of certain Phœnomena in Electricity, *n.* 497, *p.* 368.
Norfolk, of the *Roman* Camp there at *Castor*, *n.* 493, *p.* 196.
Northern Lights *Feb.* 15 and 16, 1749-50, obs. by Dr. *John Huxham*, *n.* 495, *p.* 472.
Northampton, of an Earthquake there *Sept.* 30, 1750. by Dr. *Doddridge*, *n.* 497, *p.* 712.
Norwich, a *Halo*, or *Mock Sun* obs. there, by Mr. *Arderon*, *n.* 493, *p.* 203.—An Explosion in the Air heard there, *June* 7, 1750, *n.* 497, *p.* 698.

O.

Observationes aliquæ Astronomicæ, à P. Suarez, & S. J. in Paraquaria *habitæ* 1747. *n.* 491, *p.* 8.
———— *variæ* Pekini Sin. 1748, *n.* 494, *p.* 305—319.
Observations on the Northern Lights *Feb.* 15 and 16, 1749-50, by *J. Huxham*, *n.* 495, *p.* 472.
Observatory, the portable; or the Equatorial Telescope, *n.* 493, *p.* 242.
Occultatio Martis & Lunæ Pekini, *Dec.* 6, 1747. *n.* 494, *p.* 312.
Odours do not pass through Glass by Electricity, *n.* 494, *p.* 348.

Orbits of Planets, their Contraction, *n.* 494, p. 356.
Orkney, of the Tides there, by Mr. *Mackenzie*, *n.* 492, *p.* 149.

P.

Paintings at *Herculaneum*, Remarks on them, *n.* 491, *p.* 14.
Paper Money current among the *Chineſe*, *n.* 494, *p.* 330.
Papers, ſeveral, concerning a new Semi-Metal, called *Platina*, *n.* 496, *p.* 584—596.
Paraquaria, *Obſ. Aſtronomicæ ibidem habitæ*, 1747. *per Jeſuitas*, *n.* 491, *p.* 8.
Parſons, M. D. (*James*) of the *Rana Piſcatrix*, *n.* 492, *p.* 126.
Paſchal Limits (*Gregorian*) ſhewn by the Earl of *Macclesfield*, *n.* 495, *p.* 431.
Peck, a Meaſure, *n.* 491, *p.* 65.
Pennant (Mr.) of an Earthquake in *Flintſhire*, *April* 2, 1750, *n.* 497, *p.* 687.
Peſcennius Niger, Reflections on his Medals, *n.* 495, *p.* 452.
Philoſophy of Earthquakes, by Dr. *Wm. Stukely*, *n.* 497, *p.* 731, *&c.*
Phœnomena (certain) in Electricity examined, by Abbe *Nollet*, *n.* 494, *p.* 370—397.
Pietra de Mombazza, or the Rhinoceros Bezoar, *n.* 492, *p.* 119.
——*de Cobra de Cabelos*, or pretended *Serpent-ſtone*, *ib. p.* 121.
Pipe, or But of Wine, *&c.* *n.* 491, *p.* 55.
Planet, or *Star*, to find at Noon-day, *n.* 493, *p.* 245.
Planets, of the Contraction of their Orbits, *n.* 494, *p.* 356.
Plants, a Catalogue of the 50 from the Apothecaries Company, for the Year 1746, *n.* 491, *p.* 43.—for the Year 1747, *n.* 494, *p.* 331.—for the Year 1748, *ib. p.* 359.—for the Year 1749, *n.* 495. *p.* 403.
Platina, a new Semi-Metal, *n.* 496. *p.* 584.
Platt (Mr. *Joſeph*) of a ſpheroidal Stone, *n.* 496, *p.* 534.
Plymouth, of an Earthquake there, *Feb.* 8, 1749-50, *n.* 497, *p.* 693.

Polarity of a Mariners Compaſs deſtroyed by the Effects of Lightning, *n.* 492, *p.* 111.
Portable Obſervatory, or the Equatorial Teleſcope, *n.* 493, *p.* 242.
Portſmouth, of an Earthquake there, *March* 18, 1749-50, by Mr. *John Ellicott*, *n.* 497, *p.* 646.—by *Dan. Wray*, Eſq; *ib. p.* 647.—by Mr. *Taylor*, *ib. p.* 649.
Pottle, a Meaſure, *n.* 491, *p.* 65.
Pringle, M. D. *(John)* Experiments on Subſtances reſiſting Putrefaction, *n.* 495, *p* 480. 525. 550.
Purging Waters, the Strength of ſeveral examined, by Dr. *Stephen Hales*, *n.* 495, *p.* 446.
Putrefaction, what Subſtances reſiſt it, *n.* 495, *p.* 480. and *n.* 496, *p.* 525. 550.—What haſten and promote it, *ib. p.* 553.

Q.

Quadrantal, a *Roman* Meaſure. *n.* 491, *p.* 70.
Quarter, of *London*, *ib. p.* 65.
Queries concerning the Tides in a large Ocean, *n.* 492, *p.* 158.

R.

Rainbow, an extraordinary, obſ. *July* 15, 1748, by *Peter Deval*, Eſq; *n.* 493, *p.* 193.
Rana Piſcatrix, by Dr. *James Parſons*, *n.* 492, *p.* 126.
Reaumur (M. de) of an Earthquake in *France*, *Octob.* 11, 1749, *n.* 497, *p.* 691.
Recks's (Nicolas) Caſe, touching his being born with his Feet turned inwards, *n.* 493, *p.* 239.
Reflections on the Medals of *Peſcennius Niger*, by M. le *Boze*, *n.* 495, *p.* 452.
Remarks on the Effects of Lightning, in deſtroying the Polarity of a Mariners Compaſs, *n.* 492, *p.* 113.
———made in his Travels through *Italy*, by *Rob. More*, Eſq; *n.* 495, *p.* 464.
Reſpirationis Experimenta aliqua, per Alb. Haller, *n.* 494, *p.* 325.
Reynardſon, Eſq; *(Samuel)* of *Engliſh* Weights, and Meaſures of Capacity, *n.* 491, *p.* 54.

Rhinoceros Bezoar, *n.* 492, *p.* 120.
Robertſon (Mr. *John*) of the Analogy of Logarithmic Tangents to the Meridian Line, *n.* 496, *p.* 559.
Robins (Mr. *Benjamin*) Obſ. on the Height to which Rockets aſcend, *n.* 492, *p.* 131. *n.* 496, *p.* 578; and, to what Diſtance their Light may be ſeen, *ib. p.* 582.
Roman Inſcription, Remarks upon, by Mr. *John Ward*, *n.* 494, *p.* 293.
Rondè (Mr.) dry Gangrene ſtopt, *n.* 491, *p.* 75.
Ruſſel, Eſq; (*Michael*) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 631.
Ruſſia Caſtor, the true Sort, *n.* 493, *p.* 217.
Rutlandſhire, an extraordinary Meteor ſeen there, *n.* 493, *p.* 248.

S.

Sack, of Wool, *n.* 491, *p.* 66.
Salt Mines near *Cracau*, *n.* 493, *p.* 228.
Salvadora, a new Genus of Plants, by Dr. *Garcin*, *n.* 491, *p.* 47.
Sayer (Mr. *J.*) of Mr. *Smith*'s Caſe; the Coats of his Stomach turned into a cartilaginous Subſtance, *n.* 491, *p.* 30.
Sedden (Rev. Mr. *John*) of an Earthquake at *Warrington* in *Lancaſhire*, *April* 2, 1750, *n.* 497, *p.* 695.
Sediments found in ſome particular Purging Waters, *n.* 495, *p.* 446.
Seeds, their Minuteneſs in ſome Plants, *n.* 494, *p.* 337.
Seminis viæ, *obſ. per Albert Haller*, *n.* 494, *p.* 340.
Semi-Metal, a new, called *Platina*, *n.* 496, *p.* 584.
Senex (Mrs.) ſells large Globes, prepared by her late Huſband, *n.* 493, *p.* 290.
Serpent-ſtone, of the pretended, by Sir *Hans Sloane*, Bart. *n.* 492. *p.* 118.
Short (Mr. *James*) Deſcription and Uſes of an Equatorial Teleſcope, *n.* 493, *p.* 242.
———of an Eclipſe of the *Moon*, obſ. at Mr. *Graham*'s in *Fleet-ſtreet*, 1749. *n.* 493, *p.* 247.

Short, of an Eclipſe of the *Moon*, *June* 8, 1750, *n.* 496, *p.* 523. — of the total Eclipſe of the *Moon*, *Dec.* 2, 1750, *n.* 496, *p.* 575.
Sloane, Bart. (Sir *Hans*) of the pretended Serpent-ſtone, *&c.* *n.* 432, *p.* 118.
Small Pox differently affect the *Fœtus in utero*, *n.* 493, *p.* 236.
——— appear in a Child two Days after its Birth, *n.* 493, *p.* 234.
Smeaton (*John*) Improvements of Dr. *Knight*'s Mariners Compaſs, *n.* 495, *p.* 513.
Smethurſt (*Gamaliel*) of a new-invented Shwan-pan, or *Chineſe* Accompt-Table, *n.* 491, *p.* 22.
Smith (Mr. —) his Caſe, the Coats of his Stomach turned into a cartilaginous Subſtance, *n.* 491, *n.* 39.
——(Mr. *William*) of an Earthquake at *Peterborough*, *Sept.* 30, 1750, *n.* 497, *p.* 728.
Smyrna, of an Earthquake there, by Dr. *Mackenzie*, *n.* 497, *p.* 700.
Solar Year, Remarks upon, by the Earl of *Macclesfield*, *n.* 495, *p.* 417.
Solis Eclipſis, *Julii* 14, 1748, obſ. *Madriti*, *n.* 491, *p.* 10.
Southampton, an Earthquake there, and in the Parts adjacent, *March* 18 and 19, 1749-50, *n.* 497, *p.* 652.
Spalding in *Lincolnſhire*, an Earthquake there, *Aug.* 23. 1750, *n.* 497, *p.* 725.
Spar, an Inquiry into its original State and Property, its Fluidity, and different Appearances, by Rev. Mr. *Borlace*, *n.* 493, *p.* 250, 255. 257.
Spars, or Cryſtals, plain, *n.* 493, *p.* 258. Their Incruſtations, *ib. p.* 259. their hexagonal Shape, *p.* 264. Size, *p.* 268. Colour, *p.* 270. Hardneſs, *p.* 272.
Springs, the hot at *Carlsbad*, *n.* 493, *p.* 219.
Stanford Hall in *Northamptonſhire*, an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 706.
Star, or Planet, to find at Noon-day, *n.* 493, *p.* 245.
Starr, M. D. (*John*) of an Horſe bit by a mad Dog, *n.* 495, *p.* 474.

Starr, of the *Morbus ſtrangulatorius*, *n.* 495, *p.* 435.
St. John's in *Cumberland*, a ſurpriſing Inundation in the Valley thereof, 1749, *n.* 494. *p.* 363.
Steel, the tempering accounted for, *n.* 492, *p.* 184.
Steeple of *Danbury* in *Eſſex* burnt by Lightning, *n.* 497, *p.* 611.
Stellarum quarundam auſtralium Declinationes, menſe Junio 1738, *per Dom. de la Condamine*, *n.* 492, *p.* 139.
Sterling, a round, *n.* 491, *p.* 55.
Steward (Mr.) of an Earthquake at *Deen* in *Northamptonſhire*, *Sept.* 30, 1750, *n.* 497, *p.* 721
Stomach, its Coats turned into a cartilaginous Subſtance, *n.* 491, *p.* 39.
——— an extraordinary Impoſtume formed therein, *n.* 495, *p.* 406.
Stone under the Tongue of a Lady, *n.* 491, *p.* 5.
——— the lateral Operation for it; Mr. *Mudge's* Propoſal to remove the Defects of it, *n.* 491, *p.* 24.
——— a Weight, *n.* 491, *p.* 66.
——— a flat ſpheroidal, by Mr. *Joſeph Platt*, *n.* 496, *p.* 534.
——— a ſmall flat ſpheroidal, by Dr. *Mortimer*, *n.* 496, *p.* 602.*
Strength of ſeveral Purging Waters examined, by Dr. *Hales*, *n.* 495, *p.* 446.
Struijck (Nicol.) de Viis Cometarum, *n.* 492, *p.* 89.
Stukely, M. D. (Rev. *Wm.*) Explanation of a Bas-relief, found at *York*, *n.* 493, *p.* 214.
——— of the Cauſes of Earthquakes, *n.* 497, *p.* 641, 657.
——— Philoſophy of Earthquakes, *ib. p.* 731.
Suarez, *e Soc. J. (P. Bonaventura) Obſervationes Aſtronomicæ*, 1747, *n.* 491, *p.* 8.
Subſtances reſiſting Putrefaction, *n.* 495, *p.* 480. *n.* 496, *p.* 525. 550.
Sun eclipſed *Jan.* 8, 1750, obſ. at *Rome*, by Mr. *Chriſtoph. Maire*, *n.* 494, *p.* 322.—at *Berlin*, by Mr. *Griſchow* jun. and Mr. *Kies*, *ibid. p.* 339.—by Mr. *John Catlin*, and Mr. *James Short*, *n.* 496, *p.* 523.

T.

Tangents Logarithmic, analogous to the Meridian Line, *n.* 496, *p.* 559.
Taunton in *Somersetshire*, an Earthquake there, *July* 1, 1749, *n.* 497, *p.* 690.
Taylor (Rev. Mr.) of an Earthquake at *Portsmouth*, *March* 18, 1749-50, *n.* 497, *p.* 649.
Telescope, the Equatorial, its Uses, *n.* 493, *p.* 244, 245.
Tempering of Steel accounted for, *n.* 492, *p.* 176.
Tertian, a Wine-measure, *n.* 491, *p.* 55.
Thermometer and *Barometer*, with their Extremes, at *Tooting*, 1749, *n.* 493, *p.* 211. in *London*, *ib. p.* 213.
——— the State of, on the 8th of *February* 1749-50, at *London*, *n.* 497, *p.* 608. at *Tooting*, *ib. p.* 609.
Thermometers, Dr. *Miles* of, *n.* 491, *p.* 1.—of Quick-silver the best, *ib. p.* 2.
———— their near Agreement in *London* and at *Tooting*, *n.* 493, *p.* 208.
Tides in *Orkney*, by Mr. *Murdock Mackenzie*, *n.* 492, *p.* 149.
——in a large Ocean; Queries concerning them, *ibid. p.* 158.
——of an irregular in the River of *Forth*, by Mr. *Edward Wright*, *n.* 495, *p.* 412.
Tongue, a Stone under it, *n.* 491, *p.* 5.
Tooting, of an Earthquake there *Feb.* 8, 1749-50, *n.* 497, *p.* 607.
Tradescant's Garden at *Lambeth*, some Account of, by *W. Watson*, *n.* 492, *p.* 160.
Travels through *Italy*, by *Rob. More*, Esq; *n.* 495, *p.* 464.
Troy Pound, *n.* 491, *p.* 57. 59. whence its Name, *ib. p.* 69.
Tumour on the Bladder, extirpated by Mr. *Joseph Warner*, *n.* 495, *p.* 414.
Tumours out of the Reach of the Surgeon's Fingers, an Instrument for the Extirpation of them; by Dr. *le Cat*, *n.* 491, *p.* 72. 80.
Tun of Wine, Oil, Honey, *ib. p.* 55.

V.

Valley of St. John's in *Cumberland*, a ſurpriſing Inundation there, 1749, *n.* 494, *p.* 363.
Veneris & Martis Conjunctio Pekini, *menſ. Mart.* 1748, *n.* 494, *p.* 314.
——— *& Jovis Congreſſus* Pekini, *Jan.* 1, 1748, *ib. p.* 315.
Veſica fellica non extitit in cadavere aperto, *n.* 492, *p.* 92.
Viæ Cometarum, per Nic. Struijk, *n.* 492, *p.* 89.
——*Seminis, obſ. per Alb. Haller*, *n.* 494, *p.* 340.
Ulloa (Antonius de) Obſerv. Eclipſ. Solaris, Jul. 14, *& Lunæ, Jul.* 28, 1748. *Madriti*, *n.* 491, *p.* 10.
——— of the *Vomito prieto*, or the black Vomit, *n.* 422, *p.* 134, 135.

W.

Waddell (Capt. *John*) of the Effects of Lightning on a Mariners Compaſs, *n.* 492, *p.* 111.
Ward (John) Attempt to explain an antient *Greek* Inſcription, *n.* 495, *p.* 488.
Warner (Mr. *Joſeph*) of a Tumour growing on the Inſide of the Bladder, *n.* 495, *p.* 414.
Warrington in *Lancaſhire*, an Earthquake there, *April* 2, 1750, *n.* 497, *p.* 695.
Water-ſpout, a Meteor reſembling one, *n.* 493, *p.* 248.
Watſon (Mr. *W.*) of *John Tradeſcant*'s Garden at *Lambeth*, *n.* 492, *p.* 160.——of the *Fœtus in utero* being differently affected by the Small Pox, *n.* 493, *p.* 235.——of Odours not paſſing thro' Glaſs, by Electricity, *n.* 494, *p.* 348.——of a new Semi-Metal, called *Platina*, *n.* 496, *p.* 584.
Wax and *Honey*, how gathered, *n.* 496, *p.* 536.
Weather, Dr. *Miles*, Obſ. of, *n.* 491, *p.* 1.
——— of hot, in *July* and *September* 1750, by Dr. *Miles*, *n.* 496, *p.* 571.
———————in *July* 1750, by Mr. *Arderon*, *ib. p.* 573.
Weſton with *Sutton*, in *Northamptonſhire*, of an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 707.
Weights of the *Engliſh*, by Mr. *Reynardſon*, *n.* 491, *p.* 54.
——— Troy and Avoirdupois, their Difference, *n.* 491, *p.* 59,

p. 59. of a cubic Foot of Spring Water, *ib. p.* 63. Apothecaries, *ib. p.* 66. Goldſmiths, *ibid.*

Wey of Cheeſe, *n.* 491, *p.* 66.

Wilmer, M. D. *(John)* Catalogue of the 50 Plants from *Chelſea* Garden, for the Year 1747, *n.* 494, *p.* 331.—for the Year 1748, *ib. p.* 359.—for the Year 1749, *ib.* 403.

Winbourn in *Dorſetſhire*, of an Earthquake there, *May* 4, 1749, *p.* 689.

Womb, an Excreſcence from thence extirpated by Dr. *John Burton*, *n.* 495, *p.* 520.

Women, the Operation of *Lithotomy* on them, by Dr. *le Cat*, *n.* 492, *p.* 97.

Wray, Eſq; *(Daniel)* of an Earthquake at *Portſmouth*, *March* 18, 1749-50, *n.* 497, *p.* 646, 647.

Wright (Mr. *Edward)* of an irregular Tide in the River of *Forth*, *n.* 495, *p.* 412.

Y.

York, a Bas-relief of *Mithras* found there, *n.* 493, *p.* 214.

FINIS.

ERRATA in Vol. XLVI. of *Philoſ. Tranſactions.*

Tranſact. N° 490. p. 613. l. 10. for *Walling* read *Shalford Farm (adjoining to Waſing) in the Pariſh of Brimpton.*

Tranſact. N° 494. p. 295. l. 2. for 1702. re d 1699. P. 301. l. 29. and p. 304. l. 15. for *Rineſius* read *Reineſius.*

Tranſact. N° 495. p. 491. l. 17. and p. 496. l. 5. for ΜΑΡΑΘΟΝΙΟΣ read ΜΑΡΑΘΩΝΙΟΣ. P. 495. l. 23. for *Lithieullier* read *Lethieullier.*

P. 499, Note, l. 6. for ΝΙΚΟΜΗΔΟΥΣ read ΝΙΚΟΜΗΔΟΥ.

transactions.

AMNH LIBRARY
100223513